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The Present Status of Spraying and Dusting for Control of Citrus Pests

By W. W. Yothers, Bureau of Entomology, U. S. Dept. of Agriculture

(Paper read at the meeting of the Florida State Horticultural Society at Orlando, April 19, 1923.)

Introduction

It is advisable to discuss the present status of both spraying and dusting for the control of citrus pests. There are so many different brands of oil emulsions and so many forms of sulphur on the market that growers hardly know which to use. A great many growers are also undecided as to the value of dusting.

Insecticides for White Flies and Scale Insects

Practically all of the spraying for the control of the several species of scale insects and white flies is done with emulsions containing about 65% of lubricating oil. At present it is not known just what physical properties an oil should possess so that it will have the greatest insecticidal value. Very little research work has been done along these lines. A year ago we sent a memorandum to Washington requesting that an investigation be started to determine this matter. Such information will be of great value to the manufacturers of emulsions as well as to the citrus growers. No doubt much money is being spent for oils which may not be entirely suitable for the purpose for which they are used. A light oil does not produce a satisfactory mortality on scale insects. A medium or heavy oil seems to be necessary to control most species of scale insects.

Most citrus growers do not desire nor do they find it convenient to make their own emulsions even tho the process is extremely simple. At the present time the average grower pays from 50 to 60 cents per gallon for emulsions when an equally satisfactory article could be made by him for from 15 to 17 cents per gallon. Fortunately for the Florida grower, all of the oil emulsions sold in this state are satisfactory for the purpose intended. There are no fraudulent insecticides sold extensively for citrus pests in this state.

Bordeaux-oil emulsion, first used by Mr. J. R. Winston, U. S. Department of Agriculture, Citrus Disease Laboratory, is gaining considerable favor among several large growers. This combined fungicide and insecticide produces a crop of fruit 100% commercially free from melanose with one application if put on at the proper time. Owing to the insecticide in the combination scale insects and white flies do not get nearly so abundant as if Bordeaux alone is used. We have found it necessary however to make a most thorough application of straight oil emulsion the last of June or the first week in July. There has not been the trouble with scale insects following this combination as was expected. Following this straight oil emulsion application, scale insects do not get any more abundant than is the case following the ordinary grove practices where Bordeaux is omitted. This combination spray places the control of melanose at the discretion of the citrus grower. The investigators have done their part.

One objection to the use of this combination is the unnecessarily cumbersome methods of preparing Bordeaux mixture as are described in most State and Federal publications. In practically all of our work we proceed as follows: While the agitator is running and after a few gallons of water have been placed in the tank the hydrated lime powder is shaken in and all the lime is added before the tank is one-third full. The requisite amount of finely ground bluestone is then placed in a sieve with a bottom of copper screening. The rest of the water is then run through the sieve. By the time the tank is approximately three-fourths full the bluestone is dissolved, thus the Bordeaux is complete. The oil emulsion is then added while the agitator is yet running. This method has been followed out in a number of places

over the state in several hundred acres and the growers have succeeded with it. This method does not require any platform, barrels, numerous buckets or plumbing connections, and in fact little or no technical training.

The only objection to the use of oil emulsions on citrus trees is that in some cases shadowing or spotting of the fruit takes place after spraying in May or June. Some citrus growers consider this spotting so serious that they do all their spraying with oil emulsions in the fall and winter. If extremely weak Bordeaux is added to the water making the Bordeaux-oil emulsion spray, no spotting will take place. This however makes the material a weak fungicide and it might not be advisable to use it.

Spraying for Rust Mites

It has been known for many years that rust mites are extremely sensitive to sulphur in any form. At the present time there are a great many different forms of sulphur from which the grower may choose one for his particular needs.

Lime sulphur solution is used more extensively than all other forms of sulphur sprays combined. This material is exceedingly effective in killing rust mites and thus producing bright fruit. It will probably be many years before a cheaper and more effective material will be found and the Florida citrus grower would do well to use this material until he is absolutely certain that some other form of sulphur is cheaper and equally as effective.

Several powdered forms of sulphur designed to be used in liquid spraying have been offered to the citrus grower as substitutes for lime sulphur solution. Barium tetrasulphide and dry lime sulphur are perhaps the most promising ones and these have given satisfactory results wherever used. Their cost is so much greater than the lime sulphur solution that their use has never been very extensive. Soluble sulphur is recommended only to be used in combination with an oil spray for scale insects, white flies and rust mites.

The oil emulsions have been combined with soda or soluble sulphur for many years in order to make an all around spray for scale insects, white flies and rust mites. In every case where this has been used and applied thoroughly, satisfactory results followed. The writer sees no objections whatever to this combination and in our opinion it should be used more than at the present time. Oil emulsion combined with lime sulphur solution is a more recent spray. With the proper mulsion or with any emulsion stabilized in the proper manner this combination is quite satisfactory. It is not a chemically compatible combination with most emulsions and therefore should only be used by the grower who understands spraying thoroughly. The use of this combination is slowly gaining and a few growers now use it in all of their spraying.

Dusting

In so far as is known, dusting has not been found to be effective in killing scale insects and white flies. It would be a great achievement if a dust were compounded for this purpose. It may be that such a dust will be originated in the course of a few years. Dusting with tobacco dusts for the control of thrips is only partially successful. Watson found that in one experiment only about 55% were killed and none were affected except where the dust was driven directly into the blossoms or onto the small fruit from the exhaust pipes. The drift dusting did little or no good.

Purple Red Spiders

It has long been supposed by both entomologists and citrus growers that all species of red spiders were extremely sensitive to sulphur when applied as a dust. It is a matter of much regret that this belief is not wholly in accordance with the facts. It may be that the six-spotted mite or the six-spotted red spider is easily controlled by dusting with sulphur. In fact all of the minor experiments indicate that this species is much more sensitive to sulphur dust than the purple red spider.

In order to test the effect of sulphur on the purple mite several experiments were conducted. On April 3rd, 1922, a few trees were dusted with a hand duster using a mixture of 80% sulphur and 20% hydrated lime. The mites were not killed immediately and many living specimens were present for four days after the dusting. In fact it was not possible to tell if any less red spiders were present on the fourth day than there were present before the dusting. Another experiment was carried on in a grove of 600 small trees. The dusting was done on April 20th, using a power machine and flour of sulphur. Examinations made three hours after the dusting indicated that no mortality had taken place. The red spiders were observed resting quietly on leaves where much sulphur had fallen. On the following day there was some evidence of mortality but great numbers of living red spiders were present. An examination made 27 hours after the dusting indicated that about 50% had been killed. On the fourth day after the dusting at least 75% had been killed, while on the sixth day 93% had died, which is the greatest mortality produced by the dusting. After this date the percentage of mortality decreased until on May 9th, or 19 days after the dusting, only 75% were killed. The sulphur in this case remained on the trees from April 20th until May 4th when it was washed off by a heavy rain. During this time daily observations showed that red spiders crawled over the leaves with sulphur adhering to the hairs on their backs. We also saw red spiders quietly resting with grains of sulphur at their feet. It was very noticeable, however, that the damage to the foliage was much less on the dusted trees than it was on the undusted trees. Again on March 17th, 1923, several citrus trees heavily infested with the purple red spider were dusted with a hand duster. After waiting four days for the spiders to die the trees were sprayed with lime sulphur solution. During this period these red spiders were observed to crawl around with grains of sulphur on their backs and some of them rested quietly with grains of sulphur all about them. In practically all of the experiments made young mites as well as adult females and males were present. In all probability dusting with sulphur for the control of the red spiders will be highly satisfactory if the temperature ranges from 90 to 95 degrees, but it is extremely doubtful if it will produce a commercial control in the winter or when the temperature ranges from 70 to 85 degrees.

Dusting for Rust Mites

It has been known for many years that the rust mites can be easily controlled by dusting with sulphur. It was formerly thought that this dusting should be done early in the morning when the foliage was wet with dew. It is now known that dusting is equally effective if done during the hottest and dryest part of the day. The value of dusting lies in the fact that large acreages can be gone over in a very short period of time. It has great value as an emergency grove practice. It also is particularly adapted for community work in controlling rust mites. Since it is human nature for every citrus grower in a community to desire to have his grove dusted or treated on the same day, this method can comply with this desire reasonably well.

At the present time there are a great many kinds of sulphur on the market which are designed for rust mite control. Some of these are flowers of sulphur, some flour of sulphur and various forms of sulphur ground to different degrees of fine-

ness. Many mixtures of sulphur and lime are also on the market. My opinion is that any form of sulphur that will go through a dusting machine and settle on the foliage will produce satisfactory results.

While our data on the cost of dusting is not extensive we believe it will cost about one-half on the average as much per application as it does to apply lime sulphur solution. In some cases the cost will be slightly greater. The cost of dusting will not vary to the same extent as the cost of spraying with lime sulphur solution. This is due to a more or less fixed charge for the cost of materials which is a large proportion of the entire cost. The cost of spraying with lime sulphur will depend to a great extent upon the equipment and the cost of labor and not so much upon the cost of the spray material. We doubt very much if it will pay to dust groves where the shade from the foliage does not cover a large percentage of the entire surface of the ground. We also doubt very much if it will pay a small grower to purchase a dusting machine when he already has a spraying machine. For one dusting to be as effective as one application of lime sulphur solution the sulphur should remain on the foliage for 4 or 5 days before a drenching rain. The idea being that during this period of time all the eggs which are present at the time of dusting will hatch and the young mites will be killed by the sulphur which is present on the foliage.

The main objection to dusting is the fact that the sulphur may be washed off by a drenching rain before it has remained on the trees sufficiently long to kill all the young mites as they hatch from the eggs. It thus seems that it is more uncertain than spraying with lime sulphur solution. Another objection is the disagreeableness of applying the dusts. It seems practically impossible to dust a grove without getting sulphur in the eyes of the operators. This causes great pain, and while this may not be of any great importance where dusting is only to be done for one or two days during the year, it certainly is of considerable importance if dusting is to be carried on extensively. Some means should be devised whereby operators of dusting machines can protect their eyes from the dusts.

Conclusion

At the present time practically all of the spraying for the control of scale insects and white flies is done with emulsions made of cheap lubricating oil. As yet no dust has been originated for the control of these pests. Dusting for the purple species of red spiders is not entirely successful. If such dusting is done on hot days with the temperature ranging from 90 to 95 degrees good results will follow. When it is desired to control this pest in winter it may be advisable to use lime sulphur solution. Practically all the spraying for the control of rust mites is done with lime sulphur solution. Dusting for rust mites is also satisfactory and all dry forms of dusting sulphurs have given satisfactory results. Dusting with sulphurs for rust mites, in order to be as effective as spraying with lime sulphur solution, 4 or 5 days should elapse after the dusting before a drenching rain washes the sulphur from the trees.

RUST MITES INCREASE RAPIDLY IN DRY WEATHER

The citrus rust mite, which damages the fruit and leaves by sucking the plant juices from them, may be controlled by using some of the sulphur compounds, according to Prof. J. R. Watson of the Florida Experiment Station.

The rust mite is a very small insect, scarcely visible to the naked eye, but when present in large numbers they are noticed by their rusty, powdery appearance on the fruit and leaves. They usually are most abundant on the half-shaded places of the fruit, and the increase is very rapid under favorable weather conditions such as a long dry spell.

The best spray for their control is lime-sulphur. It is used at rate of 1 gallon of the concentrated lime-sulphur stock solution to from 65 to 75 gallons of water.

Dry sulphur, often mixed with lime, applied by means of a blower or duster, may be used as a means of control, and is much more cheaply and quickly applied than the liquid.

The fruit should be watched constantly, and when the rust mites first appear apply the spray or dust. Old fruit, such as from the "June bloom" of the previous year, is most likely to be infested.

For more detailed information request a copy of Bulletin 148 of the Florida Experiment Station.

WORST INSECT ENEMY OF CITRUS WILL DIE, IF SPRAYED WITH OIL

The worst insect enemy of citrus is said to be the common whitefly. Spraying this insect with a solution of oil, soap and water is an effective remedy, but it should not be neglected, for the whitefly has a reputation for increasing in numbers equal to that of the housefly.

The whitefly is injurious to citrus in three ways: First, it draws immense quantities of sap from the trees; second, its larvae throws off from its alimentary tract a sweetish nectar-like substance called honeydew in which grows a jet-black fungus called "sooty mold," which requires that fruit be washed before being shipped and which keeps light from entering the fruit; third, the sooty mold is indirectly responsible for an increase in the amount of certain other troubles (purple and long scale, for instance.)

Specialists of the Florida Experiment Station recommend that citrus trees (oranges and grapefruit) be sprayed with an oil emulsion in May when the fruit is at least an inch in diameter for the purpose of controlling the whitefly. The following formula, by Prof. W. W .Yothers of the United States Department of Agriculture, has been found satisfactory:

Soap ----------2 pounds
Paraffin oil ----------2 gallons
Water ----------1 gallon

These substances should be mixed together by heating to the boiling point and forcing twice through a hand pump. When ready to use, this amount of stock solution should be mixed with 200 gallons of water. This formula requires soft water. Hard water must be softened.

Growers who are not familiar with whitefly control would do well to consult with their county agents before attempting any control measure.

WILL INCREASE CAPACITY

Preparations are now being made by the Kissimmee Citrus Growers' Association to increase the capacity of its packing house to six cars per day, in anticipation of a 150,000 box crop next season. During the current season the association shipped 117,000 boxes of fruit. In six years, Manager H. C. Plano reports, the association has increased its volume of shipments more than 400 per cent.

ANOTHER COUNTY AGENT

F. L. Craft, an experienced southern farmer and farm leader, has been named county agent of Alachua county, his appointment being effective May 14.

Mr. Craft was born and educated in Mississippi. He has had 17 years of actual experience as a farmer, two of which were as a trucker in Florida. In addition he has had nearly six years' training as an agricultural extension worker in his native state and as a worker with the State Plant Board of Florida.

The Present Status of Spraying and Dusting for Control of Citrus Diseases

By H. E. Stevens, County Agent, Fort Myers

(Paper prepared for the State Horticultural Society meeting at Orlando, April, 1923.)

I find that it is somewhat difficult to treat this subject at the present time and bring out much of practical value to the citrus grower. Such a discussion is apt to result in a one-sided comparison of the two methods with the known data largely on the less popular side.

Dusting became popular with the citrus growers during the past two seasons and very satisfactory results have been obtained in controlling certain insect pests with certain dusts. It is a question now whether or not dusting can be applied to our citrus diseases with the same degree of success, and just how far it can be relied upon to take the place of the liquid sprays commonly employed for such purposes. As yet I have been unable to answer this question to my own satisfaction, and I have also been unable to obtain sufficient data on the subject to warrant any definite conclusions.

Dusting for the control of citrus diseases is a recent innovation. It has hardly been given sufficient trial as yet to condemn or commend. It is an experiment we are going through and one that I believe may be productive of promising results. I am basing this statement on my own limited observations and what fragmentary data I have been able to obtain. One or two seasons later we should be able to know just what dusting will accomplish in the way of controlling citrus diseases and how far we may substitute it for the liquid sprays.

Spraying for the control of citrus diseases has been practiced in the past when absolute necessity has demanded it. The fungicides have never been generally used in the grove as they have on other crops, and only when a disease has threatened to completely ruin the crop has the average citrus grower summoned courage enough to spray his trees with Bordeaux mixture or some other equally effective fungicide. There are ample reasons for this due in part to the nature of the citrus tree and conditions affecting the groves.

The situation is rather complicated since spraying for the control of citrus diseases usually invites an increase of insect pests. This means an added spraying operation or two for the control of scale and whitefly in addition to those normally sufficient for the control of these pests.

The scale, whitefly and rust mite are held in check to a large extent by certain fungi. These fungi attack and kill large numbers of these pests at favorable periods during the season, and they are a decided aid to the citrus growing in helping to keep the scale and whitefly under control. They help materially in cutting down the seasons' spray bill for insect pests. Naturally the growers wish to preserve as much of this fungus growth in the trees as possible even though they spray systematically with the oil sprays, oil emulsions or soap solutions which do not affect fungi.

For this reason spraying with fungicides is sparingly done since a fungicide kills all the fungi present on the tree regardless of whether it is a friend or enemy.

The scale and whitefly fungi are usually not as well protected as some of those responsible for our citrus diseases, and a thorough application of a strong fungicide like Bordeaux mixture may largely eliminate these from the grove. This generally means a rapid increase in insect pests, and additional sprayings for insect control. Thus the use of Bordeaux mixture or spraying with any of the fungicides for disease control has never been very popular with the citrus grower, and he has avoided the use of such sprays just as far as possible.

However we find it is becoming more and more important to control certain citrus diseases if bright fruit is desired and if a profitable crop is to be produced. This has called for a certain amount of spraying each season for disease control. The inroads of citrus scab and melanose on the citrus fruits has awakened in the grower the necessity of taking active measures to protect his crop, at least through the critical period. Hence a certain amount of spraying is done for the control of citrus scab in localities where this disease is usually a troublesome factor and more recently a considerable amount of spraying has been done for the control of melanose.

For scab control the lime-sulphur solutions are generally used except in cases of severe infection or in localities where the disease is continually present. In those cases Bordeaux mixture may be used throughout the spraying period or an application of Bordeaux mixture may be supplemented with one or two applications of lime-sulphur solution.

The lime-sulphur solution is probably the more popular and more widely used spray for citrus scab control in the bearing grove, and it seems to give good results in localities where the disease is less severe. Lime-sulphur solution is not as strong a fungicide as Bordeaux mixture by any means, but it is one of our best sprays for the rust mite and in the dilutions ordinarily used for scab control it will kill any scale or white fly in the crawler stage, present at that time.

This is quite an advantage over the ordinary Bordeaux mixture and in addition to scab control the grower receives a certain amount of insect control from his scab spraying operations.

Citrus scab is erratic in its behavior, and injury from this disease is almost entirely dependent upon the weather conditions during the early period of the citrus growth. If the weather is dry and hot during the bloom period and the following month or six weeks, little, if any, scab will develop even though the disease is present in the grove and no spraying has been done. However, should a cool wet period occur during this time, a heavy scab infection is very apt to result, and the injury can be done in a few hours time.

This condition of affairs causes the citrus growers to often take chances with scab that they would not do if the disease appeared regularly each season. Knowing the comparatively

short period during which the fruit may become infected, he may gamble on the weather being dry during this period and omit the necessary scab sprayings from his spray schedule. If he has guessed right and the weather is dry he will be all right as far as his fruit is concerned; but if he fails to guess right, he will find it too late to remedy the mistake, and, in addition, he will probably have a large percentage of scab fruit to market.

For melanose control the Bordeaux oil emulsion spray is advocated, and it seems to be giving satisfactory results in several localties where it has been used.

Bordeaux mixture has never been a popular spray with the citrus grower. It is one of our best fungicides at the present time, and the one most widely used for the control of plant diseases. It is somewhat troublesome to make and some degree of precision is necessary in its preparation to insure an efficient mixture. There is no doubt but what this mixture will control any of our citrus diseases that can be controlled by a spray solution if it is applied thoroughly and often enough. Its killing effect on the "friendly fungi" has prejudiced the citrus grower against its use since a spraying with Bordeaux mixture invariably means an increase in the amount of scale and whitefly in the grove. This, however, happens through the use of any fungicide in the grove for a mixture used to kill one fungus will not discriminate against another, but the effects following the use of Bordeaux mixture is more pronounced since it is a stronger fungicide. The addition of oil emulsion to Bordeaux mixture before it is used in the grove is a decided improvement over the old method of using the straight Bordeaux mixture. While the oil emulsion does not detract the strength of the Bordeaux mixture to the extent of protecting the friendly fungi, it will have a tendency to kill any scale or whitefly it comes in contact with at the time it is applied. This permits of a more frequent use of the Bordeaux oil emulsion combination without the danger of the rapid increase in insect pests which follow two or three successive applications of straight Bordeaux mixture. It should be borne in mind that the Bordeaux oil emulsion spray kills the friendly fungi just as readily as the plain Bordeaux mixture, and that it is just as necessary to follow such sprayings with a good contact insecticide as it is in the case when straight Bordeaux mixture has been used. The Bordeaux oil emulsion may delay the increase of insect pests for a time, but it will not prevent it and artificial means will have to be employed until the friendly fungi become re-established in the grove. For grove spraying the Bordeaux oil emulsion is far preferable to the straight Bordeaux mixture.

We have not made the progress in spraying for citrus diseases that has been made along similar lines for the control of citrus insects. It is probably a more complicated problem, and one that it will not be easy to solve by a simple remedy for all diseases.

It is a subject, however, that needs wider study and further investigation supplemented with some well planned field experiments that should be of scientific as well as practical value. The control of citrus diseases is an important part in the production of this crop, and there should be a well defined and systematic plan to follow for this purpose. In this respect we are lacking in data in many cases. Since our known fungicides are more or less open to objection for use in the grove, is there any other substance that might be substituted with better results, or is there a possibility of changing our methods of disease control? These are subjects that might be given serious thought. As it is we have gone along using the methods handed down from the apple orchard, peach orchard and grape vineyard, and have tried to modify these to suit our grove conditions. Where this can be done satisfactorily, all is well and good, but we find instances where it can not be done. Where a citrus grower feels that he is going to get into as much trouble by using a fungicide as he expects to avoid by its use, he is not going to be very enthusiastic about applying such a spray to his trees. This is pretty much the attitude of the citrus grower who has had experience with Bordeaux mixture in the past.

Spraying is more or less costly at best, and there is a limit to the number of spraying operations that one can profitably apply to the citrus crop. We should expect the maximum results from the standpoint of effectiveness and this is dependent on the proper application of a proper mixture at the proper time. Unless these rules are followed especially in regard to spraying for disease control, the spraying operation may just as well be omitted.

Dusting for the control of citrus diseases as previously stated is something new and still an experiment. Just how effective it will prove to be for the control of citrus diseases remains to be seen. The dust method has certain features that appeal to the citrus grower, and, if an efficient and moderate price dust can be obtained, there is little question but what it will be popularly received. The dust can be handled with greater ease than the liquid sprays since there is no mixing to do and no excessive weight to haul through the grove. The rapidity with which it can be applied gives it a decided advantage over the liquid sprays, and the dust may be readily applied to groves inaccessible to the average spraying machine.

The dust method also has certain disadvantages that we must consider as well as its advantages. The dust should be applied to wet foliage for satisfactory results since a certain amount of moisture is necessary for the fungicidal action of the dust. This means that the groves should be sprayed when the trees are wet with dew or immediately following rains which limits the time of operations in the groves. For small acreages this may not be such a great disadvantage, but in the larger groves it may interfere materially with the work.

Two types of dust are proposed at present for the control of diseases—a Bordeaux mixture in powder form and a copper lime dust made up of hydrated lime and finely powdered copper sulphate. I am more familiar with the latter type, as the past season I had occasion to experiment a little with the copper lime dust in a limited way, and to observe its effect on some of the vegetable crops. As yet I have been unable to observe the effects of the copper lime dust in the citrus grove, but this season it is planned to give the copper lime dust a thorough test in the citrus grove for the control of melanose and citrus scab.

The past year I obtained some very promising results in the control of Mango Anthracnose through the use of copper lime dust B-11 or 15-85. The first dusting was made when the tree was in full bloom and three other applications were made at two and three week intervals. The dusted tree set a large percentage of its fruit and matured the greater part of it practically free from Anthracnose. A similar tree near by that was not dusted set very little fruit, and this was so badly affected by Anthracnose that it dropped practically all its fruit before maturity.

From what information I can obtain and from what few observations

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GROVE CALENDAR FOR JUNE

Timely Suggestions for Grove Work During the Present Month

Stop cultivating bearing groves when summer rains begin.

Finish fertilizing early this month.

Plant bush velvet beans or cowpeas in the middles of your groves.

Prune out dead wood in citrus trees to control withertip.

Watch for rust mites on citrus and at the first appearance dust with sulphur or spray with lime sulphur (1 to 70).

Spread parasitic fungi to control whitefly and purple scale on citrus, especially on trees previously sprayed with bordeaux or bordeaux oil.

Spray pecans with 4-4-50 bordeaux to control pecan scab; repeat every three or four weeks during the summer.

BIG CROP MARKETED

Florida is just completing the marketing of the greatest citrus crop in its history, and both growers and shippers are taking stock of the net results in financial returns.

As usual these results are variable. Some growers find that their crop has netted them a handsome return on the money and labor invested; some have barely "made good," and a few, perhaps, find their balance "in red."

On the whole, however, the returns have been fairly satisfactory for fruit of good quality, while the poorer grades have been marketed at a narrow margin of profit to both the grower and the shipper. This was particularly true of grapefruit. Except for periods of a few days at a time, grapefruit of fine quality has been maintained at a level of fair profit in all of the big market centers, while poor quality fruit has "gone begging" for buyers. The range between fancy and poor quality grapefruit has been at times abnormally great, showing that the Northern consumer is more and more discriminating in favor of high class fruit. While the range on oranges has not been so pronounced, the tendency of the consumer to demand a higher grade fruit for which he is willing to pay a higher price, has been reflected in the market returns.

The fact that Florida's record citrus crop, the quality of which as a whole was by no means high, has been sold to as good advantage as it has, may be attributed to three main factors—better marketing facilities, better marketing practices, and better advertising—which have prevailed during the season just closing.

But the one outstanding feature of the season's marketing, and the one which should be brought home to every citrus grower, is the advantage in financial returns enjoyed by the producer of high quality fruit over the producer of medium or low grade fruit. With an even greater crop in prospect for the coming season, and still greater production in the years to come as new groves come into bearing, it should, in the light of past experience, be the aim of every grower to bend every effort to the production of fruit of the highest possible quality that will appeal to the palate of the consumer, and to see that it is packed and shipped so attractively that it will appeal to the eye of the buyer. If proper attention is given to these details and proper marketing practices are employed, the Florida citrus growers may face any probable production of the coming years with confidence that the increased consumer demand for Florida fruits will more than keep pace with the increasing production—and that the grower will be able to sell his crop at a profit. But, more and more, the grower of low grade fruit will find his markets and his profits dwindling.

GROVE PROBLEMS

The Citrus Industry is greatly pleased at the interest which has been manifested in its new department, "Grove Problems," which has been inaugurated under the supervision of Mr. L. DeWitt Niles, of Florence Villa. The magazine has received many expressions of approval of this new department, and already numerous inquiries have been directed to Mr. Niles requesting his aid in the solution of grove problems. All readers of The Citrus Industry are invited to avail themselves of the services of this department for aid in solving any practical grove problem.

Copious rains over most sections of the citrus belt during the latter part of May, have still further enhanced the prospect of another record crop next season. Nature appears to be doing her part to make a bigger crop; growers should do their part to make it a **better** crop.

Extensive plantings of avocados, grapes and other fruits suitable to Florida conditions, have been and are being made this season. In large part these plantings are being made by owners of citrus groves who see the wisdom of diversifying their horticultural efforts.

URGES INTERCHANGE OF FACILITIES

It is unfortunate that all railroad officials are not as broad-minded in their views of the proper relationship between the carrier and the shipper and between the various carriers themselves, as is President Warfield of the Seaboard Air Line. The Seaboard Air Line has not been without criticism along with other railroads, in shipping circles, and doubtless this criticism has at times been just; but shipping interests generally will agree with Mr. Warfield's view that many railroads are taking an exceedingly narrow view in opposing an interchange of facilities which would tend to give better service to shippers. Shippers of fruits and other perishable products are particularly interested in this feature of the Transportation Act.

Characterizing the position of the railroads as extremely critical until Congress determines the future of the Transportation Act, S. Davies Warfield, President of the Seaboard Air Line, in his annual report to stockholders, declared as untenable the position recently taken by many railroad executives in urging stockholders to request Congress to preserve the Transportation Act without amendment, while at the same time they ignore the provisions for effecting greater economies to the public through joint use of equipment and other facilities, required under the Act.

The policy of watchful waiting on the part of railroad executives in the present legislative crisis, Mr. Warfield believes, carries with it grave personal responsibility, is a serious menace to private operation, and must eventually be abandoned just as opposition by the executives to the fundamental provisions of the Transportation Act has now been reversed.

Mr. Warfield points out that the rate-making revenue and other provisions of this Act particularly meant for retention "were granted in recognition by Congress of the relation that one railroad bears to another, each a part of a National system of transportation composed of a large number of individual railroads," and were coupled in the Act with definite inter-carrier responsibilities.

"Congress," says Mr. Warfield, "specifically provided in the Act that these inter-carrier relations must be also recognized by the railroads by bringing about the joint use of such railroad equipment and facilities, without respect to ownership, as would produce better service at reduced cost. The Interstate Commerce Commission was accordingly authorized by the Act to provide for joint facility uses and was empowered to name the terms and conditions under which joint facility uses were to be brought about in default of agreement among the railroads.

"Will not Congress, therefore, expect cooperation from the railroads in carrying out the constructive program required by the Act, of which the ratemaking-revenue and the other provisions referred to are only a part? Can the railroads expect to continue in the enjoyment of the particular provisions of the Act mentioned unless Congress can be assured of the purpose and the means offered to carry out the intent of the other provisions? Can stockholders ask Congress to preserve the legislative railroad status quo that is now being urged unless such assurances are given?

"Many instances are before the country—only recently serious litigation was begun between a number of the more important carriers—that give evidence of the lack of those inter-relations among the railroads that Congress expected the Transportation Act to establish, essential to their own success and to economical and adequate transportation."

Mr. Warfield raises the inquiry whether the railroads are organized among themselves so as to bring about the joint facility uses "Congress has required in the same Act containing the provisions the carriers now ask to be let alone."

He states: "Being intimately associated with representations made before Congress when this legislation was advocated, your President feels that the railroads cannot successfully ask for the preservation of one part of the Act while avoiding the responsibilities entailed under the provisions of another part."

Mr. Warfield states that railroad executives now urging endorsement of the Transportation Act having opposed the rate making-revenue and other provisions when initiated and laid before Congress by the National Association of Owners of Railroad Securities evidence a broad conception of duty. He intimates it is unfortunate that the provisions for joint equipment and facility uses are now opposed.

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INCREASING CITRUS PRODUCTION

Florida is not the only section in which citrus production is on the increase. In recent issues The Citrus Industry has carried reports from American consuls showing increased productions in many sections of South America, South Africa and Asiatic countries. Vice-Consul C. M. Corafa at Athens now reports an increase of 159 per cent in the total citrus production of Greece for the year 1922 over the preceding year.

The 1922 crop of citrus fruits in Greece evidenced a marked increase over that of 1921. The number of oranges picked was 152,000,000 compared with 53,000,000 in 1921; mandarins, 63,000,000 compared with 18,000,000 in 1921; and lemons, 49,000,000 compared with 31,000,000 in 1921. The total production of all citrus fruits amounted to 264,000,000 pieces compared with 102,000,000 in 1921, an increase of 159 per cent.

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More pecan trees should be planted in the citrus sections of South Florida. It requires some years for the trees to come into profitable bearing, but once they have attained the bearing age, the returns are sure and the trees will usually outlive their owner.

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Better grove practice is the first requisite to the production of better fruit—remembering always that better grove practice should have its beginning in the selection and planting of the trees.

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The summer planting season is at hand, and throughout the citrus belt there is much activity and many evidences that the citrus acreage of Florida is to be still greater increased.

The Citrus Industry in Italy

By H. C. McLean, American Commercial Attache, Rome, Italy

The cultivation of citrus fruits on a large scale is confined for the most part to three nations, the United States, Spain and Italy, whose production makes up approximately five-sixths of the total for the world. While ten years ago Spain and Italy, whose production is approximately the same, had a slight advantage over the United States, the rapid extension of the industry has by this time undoubtedly raised the latter to first place. In Spain and the United States the production of oranges greatly exceeds that of lemons, but the reverse is true in the case of Italy, where out of an annual production estimated at 8,500,000 quintals, lemons represent 5,000,000 quintals and oranges only 3,000,000 quintals.

Estimated Annual Production of Citrus Fruits in Italy.

	Quintals
Lemons	5,000,000
Oranges	3,000,000
Mandarins	300,000
Bergamots	180,000
Citrons, etc.	20,000
Total	8,500,000

According to the official statistics published by the Ministry of Agriculture, the production of citrus fruits was 6,293,000 quintals in 1920, and 6,139,000 quintals in 1921, as compared with a twelve year average of 7,281,000 quintals. These figures are generally believed to be too low and the original estimate, which is taken from a publication of Professor Gaetano Briganti, one of the leading Italian authorities, is probably nearer the truth. However, it seems evident that the production of citrus fruits has declined during the years following the war. The Ministry of Agriculture gives the following figures for the production of lemons, oranges and mandarins in 1921:

(quintals)

Districts	Lemons	Oranges	Mandarins
Sicily	2,544,000	1,467,000	117,000
Calabria	153,000	727,000	19,000
Campania	247,000	459,000	63,000
Puglie	63,000	63,000	2,000
Liguria	55,000	14,000	9,000
Sardinia	12,000	60,000	11,000

Practically all of Italy's citrus fruits are grown in Sicily, Calabria and Campania, the area devoted to their culture being divided as follows:

Province	Acres
Palermo	26,182
Messina	15,561
Catania	25,194
Siricusa	8,052
Calanisetta	247
Girgenti	1,605
Trapani	1,852
Total for Sicily	78,693
Reggia Calabria	16,529
Catanzaro & Cosenza	4,199
Total for Calabria	20,728
Salerno	4,569
Naples and Casorta	3,088
Total for Campania	7,657

It will be noted that of a total of 107,076 acres, approximately three-quarters are situated in Sicily, in the provinces of Palermo, Messina and Catania.

Citrus fruits have been grown in Italy from the earliest times, but it was only at the end of the eighteenth century that the industry began to acquire a certain importance, altho it was not until the middle of the nineteenth century that extensive plantations began to be set out. Development was especially rapid between 1870 and 1890, as exports to England and the United States increased. Prices were high, and such handsome profits were earned that vineyards, olive groves, etc., were destroyed in order to make room for fruit trees, especially lemons. No effort was too great, and even where there was nothing but bare rock terraces were constructed and filled in with earth transported on the backs of the workers. During recent years many new groves have been set out, especially in Campania, and in southern Sicily, by means of irrigation. sandy districts that formerly yielded little or nothing have been transformed into flourishing lemon groves. In Sicily the cultivation of lemons is extending more rapidly than that of oranges; however, in Campania, i. e. in the provinces of Naples, Caserta and Salerno, oranges and mandarins are preferred owing to the fact that they are less sensitive to cold. The most famous orange groves in Sicily are located in the district southwest of Mount Etna, where the best types of oranges, especially adapted for the export trade, are produced. At the present time no noticeable increase is taking place in the area devoted to the cultivation of oranges.

Both the sweet orange (citrus aurantium) and the bitter orange (citrus vulgaris) are cultivated in Italy. However, the greater part of the production is made up of the former, and the quantity of bitter oranges grown is limited. The number of varieties is very extensive, the principal types being the common round orange, the Calabrian or oval orange, the Calabrian blood orange. Exports are practically confined to blood oranges, Calabrian or oval oranges and the common orange. Calabrian oranges are especially adapted for the export trade owing to their exceptional ability to stand transportation, combined with the fact that their pulp is especially firm and aromatic. The common oranges are known by the name of the locality where they are produced, and their characteristics vary in accordance with local conditions. Owing to the fact that the same grove frequently contains many different varieties of oranges and that no distinction is made between the different types at the time of picking and shipment, it is out of the question to give even an approximate estimate of the quantity of each variety produced.

For the most part the new orange groves are planted with those varieties which are most in demand for export, although in certain cases the common varieties intended for the domestic market are employed. A tendency is being shown towards greater perfection in the setting out of the new groves and special care is used in the cultivation of the plants in the nurseries and in the selection of the shoots to be grafted.

The value of the land available for citrus fruit culture is high in comparison with that of other countries and frequently the expense of constructing terraces for new groves reaches a very high figure. One marvels at the extraordinary patience with which these terraces, involving an extraordinary expenditure of diligent effort, have been erected. The space allowed for each individual tree is limited by the value of the land, but there is a tendency toward its enlargement. Both the distance between the trees and the methods of planting show the widest variations. The minimum distance may be said to be three metres and the maximum 5.6 metres. Every system of setting out the trees is employed and they are grouped sometimes in fours, in fives, or simply in rectangles, or with mandarins alternating between the orange trees. Where terraces are employed no regular system is possible, the manner in which the trees are planted depending upon the shape of the terrace. The original investment in orange groves varies widely even in the same districts. On the Amalfi coast it is estimated that the cost of terracing the land alone runs from a

minimum of 12,000 lire to a maximum of 42,000 lire per hectare, and the cost of setting out the trees reaches 27,000 to 28,000 lire by the sixth year. On the other hand at Nocera, in the same province, the total cost at the sixth year is not more than 4,000 lire. In Sicily, southwest of Etna, the expense of setting out a grove varies from a minimum per hectare of 1,500 lire on the level, where the ground has already been previously prepared, to a maximum of 10,000 lire on the volcanic hill side, where the preparation of the ground and the providing of a water supply are extremely costly. It is estimated that in the province of Salerno the mixed groves of oranges and walnuts at Nocera yield a gross income of about 4,000 lire per hectare (160 quintals of oranges and 40 quintals of walnuts), while those in the plain of Battipaglia do not yield more than 220 quintals of oranges, or 2,000 lire. In the Calabria district the yield per hectare is placed at 250 migliaia of fruit (one migliaia equals 1,040 in Sicily and 1,050 on the Amalfi coast), valued at 5,720 lire. These figures are sufficient to indicate the difficulty of arriving at any definite rule.

Only one root stock is employed throughout Italy, namely the bitter orange (Citrus higaradia) which is a variety that has good powers of resistance to diseases. The pompelmo (Citrus decumana) is not employed. The most recent practice is to make the graft at a higher point than formerly, which it is believed produces a stronger tree, and in certain instances it has been carried to the extreme of making grafts upon the branches, which results in a noticeable delay in the bearing of fruit.

The oranges are picked between February and April, and immediately after the crop is gathered the ground between the trees is broken up and from then on the weeds are kept down by superficial cultivation. In April and May the ground is prepared for irrigation, the period for which begins in May and June and ends in October and November. Irrigation takes place periodically for 8, 10, 15 or 30 days according to the season, the quantity of water employed varying with the size of the trees and the character and humidity of the soil. While in most cases irrigation is absolutely necessary, too much water is frequently employed, according to one of the leading authorities on the subject. Manure is most commonly used as fertilizer. However, especially in Sicily, there is a lack of organic fertilizer since the animal industry is little developed, especially in the vicinity of the orange groves. The use of organic matter is supplemented with commercial fertilizers, superphosphates and potash. The average amount of fertilizer applied every two years is from 200 to 300 quintals of manure with 3 or 4 quintals of superphosphates, and 1 quintal of sulphate of potash per hectare.

The pruning of the orange trees is carried out with great care and diligence, and frequently by experts. The growth of the trees is carefully followed and it is pruned first in the nursery and later when transplanted in the grove. The pruning takes place in March at periods of three years. However, during the three years periods, a certain amount of secondary pruning is done in order to remove dead branches, etc.

Many of the orange growers do little to protect their groves from plant diseases and parasites. Frequently a considerable sum is spent for cleaning the fruit after it has been picked. The principal diseases to which orange trees are subject in Italy are the so-called "Gommisi," which shows itself by gummy deposits on the trunk, and is successfully combatted by grafting on the bitter orange, and the "Marcume Radicale," a rot that attacks the roots and results in the drying up of the tree. The latter is limited to very few districts where the conditions of the subsoil are unfavorable to the cultivation of oranges. The following are the most common parasites: Pseudococcus citri, Ceroplastes sinensis, Saissaotia oleas, Aspidotus hederas, Chrysomphalus distyospermi, Parlatoria Ziziphi, Lepidosaphes Beckii, etc. Most of these parasites are effectively combatted with a solution of lime and sulphur, which, in the case of oranges, is applied annually. Italy is fortunate in having, up to the present time, been immune from the citrus canker, both the American and Japanese varieties. By law the Ministry of Agriculture is charged with the duty of taking such measures as may be necessary to combat plant disease, and in this connection has the right to inspect all properties where plants and seeds are produced or sold, and if infection is discovered, to either prescribe their disinfection or prohibit their sale. The Ministry can make obligatory the use of such remedies or other measures against plant diseases and parasites as it believes necessary in cases where their effectiveness depend upon the concerted effort of all those interested. Provision is made for the grouping of land owners, where contagious plant diseases exist, into consortiums which have the right to impose on their members an annual contribution of not more than 5 lire per hectare. Where the nature and importance of the situation makes it desirable, the state can undertake the direction of the work at its own expense, and can contribute up to one-half of the amount required for carrying out such work of combatting plant diseases and parasites. The balance, however, is for account of the interested parties; but can be advanced by the state, to be reimbursed later on.

The harvesting of the fruit extends over a period running from January to April, according to the variety, whether early or late. The blood orange is the principal early variety, which is gathered as soon as it begins to ripen, because experience has shown that the ripening process is completed in the boxes after the fruit has been packed. The principal late variety is the oval or Calabria orange, which is gathered last. It is not infrequently the case that the grower is also an exporter, and certain large growers in addition to exporting their own production, buy also from others. The export houses, which are located in the principal producing centers, make their purchases at different times, often long before the ripening of the fruit, and even when the trees begin to blossom. There are two methods of making purchases, first by count, fixing a price per migliaia, on which a discount ranging from 5 to 10 per cent, according to the degree of the maturity of the fruit is allowed, this discount being intended to cover imperfect fruit. The other method consists in purchasing the entire production of the grove in bulk. In this case the producer estimates the number of fruit of different grades and fixes a lump sum. Owing to the many disputes between buyer and seller that arise where the first method is employed, the practice of bulk purchases is extending. In both instances the picking of the fruit is for account of the buyer.

The cost of harvesting oranges in Italy is rather high, owing to the fact that the work can be carried on only during a few hours of the day, since it is necessary to wait until the fruit is entirely dry and not too cold. Men are employed to pick the fruit which is placed in baskets lined with sacking. These baskets when full are usually transported by women to certain points in the grove, where other men with great care cut off the stems leaving the calix on the fruit. Fruit which detaches itself from the stem at the time of picking is placed among the culls. The fruit is then transported to the warehouse, either in baskets if near by, or in boxes if far away, where it is piled on the

floor on a layer of straw. For every four pickers there is usually one woman who carries the baskets, and one man who cuts the stems. As an average, six workers can gather from 8,000 to 9,000 oranges per day. In the warehouse the fruit is first cleaned, if it is infected with parasites, and is sorted into first, second and third qualities, and these different qualities are again divided according to size.

For the shipment of oranges, boxes having two compartments are used. These are of different sizes and contain 160, 200, 300 or 360 fruit, according to size. Half boxes are also employed. After the oranges have been sorted they are wrapped in tissue paper and packed, this work being done by women. With regard to the sorting and packing of oranges, Spain has an advantage over Italy, owing to the fact that the work is done more accurately and the boxes are not only stronger, but have a better appearance.

The following table shows Italy's total exports of oranges by years since 1910, and the quantity exported to the United States.

Year	Total Exports (Quintals)	Exports to the United States
1910	1,204,293	13,200
1911	1,283,434	11,000
1912	1,099,878	6,970
1913	1,306,005	22,442
1914	1,330,805	4,036
1915	1,291,614	3,995
1916	1,042,901	2,424
1917	550,664	1,379
1918	425,576	1,291
1919	699,462	779
1920	813,375	5,443
1921	1st 6 mo. 1,108,321	1,564
1922	1st 9 mo. 729,539	7,492

In recent years the United States has not been a large consumer of Italian oranges. If we go back to 1908 we find that Italy exported 58,800 quintals of oranges to the United States, whereas by 1913 the quantity had fallen to 22,442 quintals. As is indicated by the above table, exports since the Armistice show a further marked decline as compared with the years immediately preceding the war. Austria-Hungary, Germany and Russia were formerly Italy's best markets, especially Austria-Hungary, exports to which in 1913 amounted to 683,100 quintals, or more than one-half the total. During the same year shipments to Russia reached 213,000 quintals, and to Germany 168,400 quintals, so that these three countries accounted for more than 80 per cent of Italy's total exports. As a result of the war the Russian market has been cut off, while the purchasing power of the countries that made up the former Austrian Empire, and of Germany, has been materially reduced. Thus during the first nine months of 1922, which is as far as the statistics are available, exports to Germany reached only 129,000 quintals, while those to Austria, Czechoslovakia and Jugoslavia combined were 77,750 quintals. On the other hand, France has come to be Italy's best customer for oranges, and exports during the first nine months of 1922 amounted to 384,000 quintals, as compared with 15,600 quintals in 1913, which was the highest total for the years immediately preceding the war. Italian oranges have apparently gained a strong position in the French market. During the war shipments to Switzerland were exceptionally heavy, having reached the extraordinary figure of 897,000 quintals in 1916. A marked decline has since taken place, but Switzerland is still a good customer and in the first nine months of 1922 its purchases amounted to 67,000 quintals.

The export season begins in November and ends in May. However, the bulk of shipments are made in February, March and April. The following table shows the totals by months from October, 1921, to September, 1922:

ITALIAN EXPORTS OF ORANGES

(Quintals)

1921	
October	1,075
November	35,377
December	100,447
1922	
January	114,330
February	161,165
March	225,233
April	156,035
May	65,043
June	6,483
July	1,111
August	132
September	7

The cooperative movement among the orange growers, which has developed so rapidly not only in the United States but also in Spain, has made no real progress in Italy, although there are a few commercial organizations among the exporters. Professor Briganti, who was sent by the Italian Ministry of Agriculture at the beginning of 1918 on a special mission to Spain in order to study agricultural methods there, reported that the extension of exports of Spanish oranges was in part at least due to the cooperative movement that has sprung up during recent years among the orange growers. Cooperative organizations in Italy could undoubtedly do much to educate the growers in scientific methods of production, including the fight against diseases, and also to standardize methods of grading, packing and shipment in such a way as to not only offer a better product, but also to offer it in a more attractive form. Furthermore such organizations could keep fully informed with regard to the conditions prevailing in the various markets and could adjust their prices and their shipments accordingly. The result ought to be lower costs and higher profits. It is true that according to the law of July, 1910, which created the Camera Agrumaria at Messina, this organization was intended to bring about an improvement in the conditions prevailing in the citrus fruit industry and was to encourage and better systematize the export trade. In this connection provision was made for the establishment of agencies abroad with a view to facilitating the exportation of selected fruit, but in practice the Camera Agrumaria has confined itself almost exclusively to the sale of citrate of lime, of which it has a monopoly, and it cannot be said to have exerted any special influence on the orange industry. One of the greatest needs in connection with the Italian citrus fruit industry is for standardization. As has already been pointed out, an exceptionally large number of types of oranges are grown, several varieties frequently being planted together, and there is a resulting lack of uniformity in the product. There seems to be no doubt that great advantages would result from a study of the varieties best suited for export from Italy and from a concentration of effort on a few types, rather than the hit-or-miss methods that have been heretofore employed. However, in order to accomplish this, some sort of centralized organization would be necessary.

Owing to the reduced demand from its principal pre-war markets in Europe and a reduction in exports to the United States, the price of Italian oranges, especially during the current year, has been low and profits have been small. Practically the only competition that Italy is obliged to face in Europe is from Spain, for exports from the United States to Europe are practically limited to Great Britain, and even in that instance, are decidedly limited.

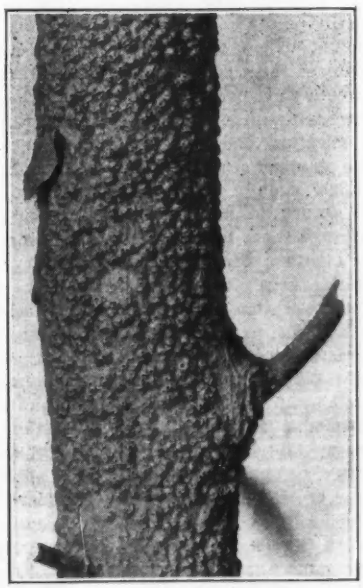
Grain alone will not give high egg production. Hens must have mash with some meat product to get high egg records. The coming of spring does not mean that feeding hens may be discontinued.

The Biological Control of Black Scale

By Cyril F. Greeves Carpenter, F. E. S., Pasadena, Cal.

In the sunny Southern states a miniature warfare is waged yearly against the harmful Black Scale, Saissetia oleae (Bernard), which attacks and feeds on the sap extracted from citrus and other trees. This fight is of great interest to one who is au fait with the life and activities of the insect world.

The black scale is one of the most expensive of our pests, for when its presence is discerned a continual fight has to be kept up in order to check its depredations, and all fruit that has become smutted by it must be washed before it can be marketed,



Showing work of the new black scale parasite, Aphycus lounsburyi, on the intermediate stages of the scales. Note the exit holes in the scales, from one to seventeen parasites issuing from a single scale, often through the same exit hole. (Photo by H. M. Armitage, Entomologist, California State Department of Agriculture.)

both of which items are a heavy expense to the grower.

Trees affected with scale look at first sight as though the stems had become warped and knotted, but on closer examination the scales can be determined. The adult females are almost hemispherical in shape, measure about a quarter of an inch, are black in color, and have markings in the form of the letter "H" which appear when they are about one-third matured. The female scales lay up to three hundred eggs per individual, and these are pale pink in color and globular in shape. The young scales are commonly known as "rubber" as they resemble grey bark, and on being crushed they exude a sticky liquid. The scales may be found on the limbs, leaves and fruit of the host plant, although the stems appear to be preferred. They are equipped with sucking mouth parts with which they pierce the epidermis and suck up the sap. This, however, is by no means the worst injury they inflict, for they produce large quantities of honeydew which is a medium for the growth of a fungous disease known as the black smut fungous. This disease gives the fruit the appearance of being covered with soot. The top portions of the fruit are usually the most affected. Fruit so smutted has to be taken into the packing houses and washed by machinery before being placed on the market, which naturally increases the cost to the grower, as he is unable to charge the public any more for the poor grade fruit.

Spraying with miscible oils and distillate emulsion has met with a certain measure of success, but by far the most satisfactory method of control, in the writer's experience, is that now employed by the U. S. Dept. of Agriculture, and known as the biological method, i. e., the introduction of parasites and predators into the orchards. This method naturally necessitated much research work and the sending abroad of collectors, as the black scale is a native of Australia and South Africa. Too often, when pests are introduced from abroad their natural insect enemies do not succeed in "stowing away" also, thus leaving the pest in a new field with slight probability of finding any local insect enemies to disturb them. Collectors were sent to South Africa and Australia in order to observe the conditions under which the scales were controlled in their native countries, and their research caused several very valuable parasites to be introduced into the United States.

The three chief factors in the natural, parasite or biological control which were introduced from these two countries were Aphycus lounsburyi, Scutellista cyanca, and Rhizobius ventralis.

Insect enemies are of two kinds: the parasite, and the predator. The former lays eggs directly into the body of its host, and these, on hatching, live on the vital tissues and quickly kill the pest. The larva that has destroyed the life of the host pupates inside the dried shell, and the adult then emerges to mate and lay eggs. The predaceous insect eats its prey bodily.

The Aphycus is a small, greyish fly measuring about one thirty-second of an inch in length. This enemy of the black scale is a parasite, as it lays its eggs on the upper portion of the host when the latter is about one-third grown, but the Aphycus appears to prefer the older to the younger scale. The eggs are not laid through the exoskeleton, as this would mean that the female parasite would have to pierce this toughened shell before being able to place the egg or eggs inside the body of the scale where the larvae would have food to work

Black scale in the adult stage on potato sprouts. (Photo by H. M. Armitage, Entomologist, California State Department of Agriculture.)

upon. The female parasite, therefore, takes the line of least resistance, and works her ovipositor—the shoot-like

Continued on Page 30

Banana Growing in Florida

By W. E. Bolles, Oldsmar, Secretary Banana Growers' Association

My experience in growing bananas and my observations of the success of other growers have demonstrated to me that the production of this tropical fruit is a practical commercial proposition in many parts of Florida. There are a number of good-sized plantations, especially in the southern half of the state, with scattered plantings here and there as far north as Jacksonville and Tallahassee.

Favorable Conditions

For a profitable commercial banana proposition I would recommend that part of the state south of a line drawn east and west from Daytona to Cedar Key. Bananas can be grown for home use north of that line, but the crop will not be so dependable for a money-making proposition. The best location for a plantation is on the south side of a lake, bay, river or stream of some kind, because this gives a little added advantage in the way of protection against cold winds from the north. Such a location is by no means essential, but it does give the grower a little advantage which is worth having.

Bananas like plenty of moisture, but they can be drowned out by too much water, just the same as other plants or fruit trees. There must be sufficient drainage to carry off excess water from heavy rains. I have my ditches all running into one main outlet ditch, and have the latter so arranged that I can close it any time I want to and hold in rain water during a somewhat dry season, or I can open it and let the water flow off freely during wet seasons.

Beyond a doubt, sub-irrigation and sub-drainage make the most scientific method for best results, as is the case with truck farmers and strawberry growers; but this is not necessary at the start, because bananas can stand more moisture than some other crops. In extraordinary wet years sub-drainage would undoubtedly be found a great advantage.

Soils Adapted

The best soils for banana plantations are: Deep muck of sufficient age to be decayed and available for plant food; low hammock land in which there is a fairly large percentage of muck; flatwoods land where the soil is dark enough to show a considerable per cent of humus, as in the Portsmouth variety of soil. On the other hand, I have seen bananas growing successfully and fruiting on high rolling citrus land of the Norfolk variety. I have seen bananas planted in a patch of white sand close to the Gulf of Mexico, and they will grow there if enough good soil is put around their roots when they are set out; but naturally no man would ever choose such a location for a commercial banana plantation. High hammock land is also good, of course—in other words, bananas enjoy a soil with plenty of moisture and plenty of decayed plant food such as dead leaves, dead weeds, old grass and other vegetable matter which will decay and make humus, and thereby help to supply nitrogen and some of the other elements required for growth and fruit.

Varieties

The leading varieties of bananas for Florida are as follows:

The Cavendish, which is sometimes called the Canary Island or dwarf or Chinese banana. It is a splendid fruiter with large bunches of excellent flavor. The stem of the plant is very short and stout, therefore being able to resist high winds successfully. The skin of the fruit is somewhat tender and the fruit ripens rapidly when it has reached mature size. I have seen bunches of Cavendish bananas raised in Florida as large as bunches of tropical bananas shipped here from Central America.

The Hart's Choice, sometimes called the Ladyfinger banana, is well suited to Florida, and a number of growers claim it is the best all-around variety. The bananas are smaller in size, but they have an excellent flavor and ready sale. The plants grow to a height of 10 or 15 feet under good conditions. There is a technical difference between the true Ladyfinger and the true Hart's Choice, but they are so closely related that one general description will answer for both.

The Orinoco banana, sometimes called the Horse banana, is numerous all through Florida, and is supposed to be more hardy than even the Hart's Choice. The Orinoco bunches are smaller and the fruits are larger. The flavor is not so good as the Cavendish or Hart's Choice. The Orinoco also grows to a height of 10 or 15 feet.

The Martinique or Jamaica banana or the Bluefields, as it is called in Hawaii, is the so-called tropical or commercial banana which is shipped into the United States in such enormous quantities—an average of 15,000,000 bunches per year. This is a true tropical banana, and yet it is not very much more tender than the Cavendish. The advantages of the Martinique over other bananas are its excellent shipping qualities. The skin is tougher and the bunches stand shipment better than other varieties. It is a heavy fruiter under tropical conditions, and these are the chief reasons why the United Fruit Company has made the Martinique its chief product. It's flavor is not so good as the Hart's Choice and the Cavendish.

Fertilizing

Fertilizing is an important factor in growing bananas. It is a good plan to fertilize three times a year: First, in late February or March, after danger of frost is past; this application should contain a good percentage of nitrogen—in other words, a grower fertilizer. The second application should be put on in June, before the summer rains come along, and should have a good percentage of phosphoric acid for fruiting purposes. The third application should be put on after the summer's rains are over, and should contain the larger percentage of potash to harden the plants and prepare them to go through the cooler months. Stable, dairy and poultry manures are good at all times of the year excepting the cold months, when is not wise to encourage rapid growth. If a frost comes along it will nip the new tender leaves, but the main stalk will usually come through unharmed. If a hard freeze kills the main stalk, the roots will generally come through safely and throw up new growth after the weather moderates. Protection of the stalk and roots against freezes can be secured the same way as in orange groves, by banking up dirt over the roots and up around the stalks when frost is threatened.

Mulch is one of the most important factors in growing bananas successfully. One cannot put too much dead vegetable matter on top of the ground around each stalk. This vegetable matter rots and furnishes plant food, also keeps the roots cool in summer and warm in winter. When the fertilizer is applied it is a good plan to pull all of the mulch back away from the plants, put on fertilizer, and immediately put the mulch back where it was. The shade and plant food created by the mulch have the effect of making the banana roots come up toward the surface, and it is easy to see why roots which have been ac-

customed to protection would soon suffer severely from exposure to the sun. In other words, when you have once started using mulch in a banana plantation you must keep it up continuously.

The character of the banana plant indicates that it was designed by nature to grow in a hammock or glade where it can enjoy some protection from the winds and hot summer sun. These conditions can be reproduced by planting wind breaks of Napier grass or bamboo around the banana plantation, and the plants be allowed to grow freely just the way they want to—in other words, allow them to make a thick growth which will shade the ground and thereby absolutely prevent the growth of grass and weeds.

Spacing

Scientifically, the proper spacing for banana plants when setting out is about 8 x 10 feet. If the planter allows only four stalks or sprouts to grow on each root, and removes all extra stalks and sprouts, the plant will produce better. In the case of a mature plant which has been scientifically cared for, there will be one full-grown stalk, one about three-fourths grown, one about half-grown and one about one-fourth grown.

All others will have been taken off to prevent them from draining the strength from the main stalks. The little sprouts act like suckers and naturally take away a great deal of strength. They can be cut off and set out to form new production, or sold under the rules of the Florida State Plant Board, of Gainesville. Practically it seems to be a demonstrated facts that in Florida it is just about as well not to be too scientific, but to strike a happy medium between science and practice, by allowing the bananas to do pretty much as they like short of permitting them to run absolutely wild. Nature likes to have a little freedom, but if a cultivated plant is allowed to romp any way it likes, it has a tendency to go back to its wild state, which generally means a reduction in fruit bearing ability.

When to Plant

The best time to set out new banana plants is during the summer months—July, August and September—when there is plenty of moisture to enable them to get a rapid start. As a matter of fact, however, they can be set out successfully any time in the year, but if put in the ground after November 1st, they are not likely to make much growth until February, and a few of them may rot in the ground before they get started.

Diseases of banana plants are few in number in Florida. The main danger is from the borer which gets into the bulb or crown at the base of the stalks. A good preventive against this pest is to use castor pomace as a fertilizer in the first or spring application. The castor pomace is rich in nitrogen and it is also poisonous enough to the borer to discourage him considerably. Goat manure is also a good spring application. Tobacco stems are excellent from the point of view of a fertilizer as well as prevention of the operations of the borer.

Caring for Plants

After a banana plant stalk has borne one bunch of bananas, that stalk might just as well be cut down, because it will never bear again. Cut it off close to the crown of the roots, but do not injure the crown. Cut the stalk up in pieces and put it in a compost bed to make humus for use later on. If you cut the stalk down and let it lie just as it is on the ground among the banana plants, this old stalk may become a nesting place for borers.

Some people refer to banana plants as banana trees. To be technical the word tree is not correct. The banana plant is a true plant from the botanical point of view, because its stalk is really composed of the stems of the leaves. It grows high enough to be classified as a tree, and I have seen it so referred to by one of the best authorities. If he can do it, I suppose we can.

After about seven years a banana plantation should be reset for best results. Most people are familiar with the fact that lilies do better if they are taken up and reset in a different location once in a while, and the banana plant is a sort of a distant cousin of the lily family. Bananas will keep on bearing if you do not transplant them, but from a commercial point of view they will pay you better to move them onto other ground once in seven years, and plant a crop of cow peas or velvet beans on the old banana field for one season. I prefer velvet beans because they are not so likely to throw root-knot into the soil.

When to Gather

All bunches of bananas are better if cut from the plant at the time when the fruits are rounded and fully matured in size but still green in color. The bunch should then be hung up in a shady place, out of the draft, and allowed to ripen if intended for home use; or should be shipped green if they are going to a distant market.

After you cut a bunch of bananas, take it immediately to a shady place, or the summer sun will "burn" the fruit and cause brown patches on the inside, which of course reduces the value for market purposes.

Rats sometimes bother banana plantations by climbing up and eating the fruit, but I find cats which know their business will soon clean a plantation from rats.

There is a great deal more that might be said about banana growing, but at the request of Hon. William A. McRae, Florida Commissioner of Agriculture, I prepared this information in the form of a short practical treatise for beginners. Those who have experience in growing bananas will understand this without my saying so.

When I began growing bananas at Oldsmar, near Tampa, quite a number of people told me it was impossible to do it successfully. I replied that I saw a few bananas growing here and there all over the southern part of the state, and where a few can be grown successfully I believed a larger number could also be grown, and this has proved to be true.

When I started, I hunted high and low for practical printed information to help me, but could not find enough in the United States. I wrote to the British West Indies, Hawaiian Islands and to England for literature, which I received in due time. The best I have found anywhere is the book by Fawcett, published for the West Indies Committee of London, England. It costs about $6, and if you intend to go into banana growing on a big commercial scale you will certainly get more than $6 worth of information from it. If, however, you only intend to plant one or two acres and grow fruit for near-by towns and cities, perhaps you will get all the information you need to start with from this brief treatise, which I have prepared at the request of Mr. McRae, who is keenly interested in advancing all departments of agriculture in Florida, and has accomplished so much for the progress of our state.

The food value of bananas is much higher than that of many other fruits. If a man were compelled to live on bananas and nothing else to save his life, bananas would carry him a much longer period than the majority of fruits. In the mature green condition bananas contain a good per cent of starch and can be fried like potatoes, in which the chief food value is also starch. When bananas begin to ripen, turning from the green color to yellow, the process is converting the starches of the fruit into sugars, which are very nutritious and strengthening.

The best time to eat bananas raw is after they have ripened to such an extent that there is no longer any green color on the skin. It should be all yellow, and if the yellow has begun to turn brown, this marks a still further advance in the process of ripening, indicating that most of the starches by this time have been converted into sugar. Many people who say they cannot eat bananas without distress in their stomachs would perhaps enjoy bananas which have reached the yellow-brown stage of ripening, and people who have delicate stomachs can get along better if they chew their food about twice as long as other people do.

I look forward to the time when Florida will produce all its own bananas, and also supply neighboring states, such as Georgia, Alabama and the Carolinas. We might be able to extend the shipments further than that, but in doing so, we must remember that we are in competition with the cheap labor of Central and South America. The big fruit importing companies, who bring so many millions of bunches of bananas into the United States each year, are strong corporations, who generally own their plantations and the ships which transport the fruit into this country. Perhaps their expense of long shipment will in some measure help to offset their advantage of cheap labor.

Every family in Florida can have a clump of banana plants in their back yard and grow their own. I do not know of an easier fruit tree to grow, nor one which is freer from diseases. A banana plant will bear fruit in less than two years after being set out, and this is one big advantage.

The vitality of the banana plant is astonishing. I had some plants uprooted and washed out by the storm of October, 1921 . I purposely allowed one of these full-grown banana plants to remain out in the weather, sunshine and rain, until February 25th, 1922—right where it laid after the storm. I then had one of my men plant it, and it rapidly threw up new sprouts and behaved just as happy and enjoyed life just as much as if it had never been disturbed. If you can show me any other kind of fruit tree which you can uproot and let lay in the sun and weather for four months without killing it, I will be glad to hear something about it. I am fully satisfied that the banana is entitled to a seat in the king row for vitality.

At any rate, I am entirely satisfied that Florida can produce all of the bananas necessary for use in our own state, and this will make many thousands of acres of land profitable and provide work for thousands of people.

The banana plant is one of the most tropical growths in Florida; it lends an air of luxuriance which no other plants provide. To my mind, the banana is in a class with the cocoanut tree and the royal palm as an emblem of the tropical character of Florida's climate.

California makes very little effort to grow bananas, because the climate there is generally so much drier and the rains come in the winter instead of in the summer. All of Florida is farther south than any point in the state of California, therefore we are more tropical and better able to grow things which are supposed to exist only near the equator.

The wholesale price of banana plants in the nurseries ranges as high as seventy-five cents each or $5.00 per dozen, depending upon the variety, character and age of the plant. The Hart's Choice and Orinoco suckers are generally sold cheaper than the Cavendish and Martinique suckers.

You can set out young plants of all sizes, from mere peepers, as they are called (which are very small, pointed sprouts, just large enough to stick their heads through the ground), up to sword suckers, which are suckers perhaps one or two feet high and have not yet developed anything more than the narrow sword-shaped leaves; or you can plant the maiden suckers, which are two to four feet high and have attained sufficient age to show wo or three of the oval-shaped mature leaves. You can also propagate bananas by root division, that is, by cutting the eyes in somewhat the same manner as you would when planting potatoes in Florida for the spring crop. Undoubtedly the best plants of all to reset are the maiden suckers, because they are nearer the fruit-bearing age. Consequently these suckers will cost more than any of the others, for the express charges will be higher, because the plants are larger and weigh more.

In shipping banana plants it is necessary to cut off all the leaves right down to the main stalk. Some people cut off the main stalk also and leave only the bulbous root or rhizome. If you cut off all the stalk down to the root, express charges will be less, but it will take your plants longer to get going good, because they must grow that much stalk over again. They will do it, but it means delay.

The Florida Banana Growers' Association was organized in Tampa in October, 1921. We believed there were enough banana growers in Florida to make such an organization useful, and our expectations have been fulfilled. It is the plan to meet only once or twice a year to exchange information for mutual benefit. The annual membership fees were fixed at the nominal amount of $1 in order to enlist the co-operation of every one interested.

The pioneer work of introducing bananas into Florida was done in 1627 by Count Odette Phillippe, of Spain, and I have in my collection several banana plants which are direct descendants of the ones which he brought into Florida.

A man who did much to make banana growing popular in Florida was E. H. Hart, who imported about a dozen leading tropical varieties for testing purposes. He selected one he considered best suited to Florida. It was his choice from all the varieties he was familiar with. It began to be called Hart's Choice, and the name has wisely been preserved as a tribute to the work of this successful horticulturist. Another man who did a great deal to promote the growing of bananas in Florida is Mr. Reasoner, who deserves much credit for his fine work around the years 1873-75.

The cost of land suitable for bananas depends upon location, quality and other advantages, the same as lands for all other purposes. If the land is naturally easy to drain, if the soil is rich muck or hammock, if the property is on or near a paved road, or close to a city or town, the value is regulated by these things. Uncleared land suitable for bananas can be bought for $25 to $50 per acre up to as much as you wish to pay.

The expense of clearing land is also dependent upon the character of the soil and the natural growth which must be removed. It may run from around $10 per acre in the case of muck, to $50 in the case of high hammock, but if you buy land heavily grown with pine and dwarf palmetto, the cost of clearing alone may run to $75 or more per acre.

I would rather pay more for good land and buy fewer acres. Some thin, light, white sandy soil in Florida is easy to clear at small expense because there is little growth on it to be taken off; but I always figure if nature cannot do much with a piece of land, I do not want to try it.

Four hundred plants to the acre means rows 10 feet apart and set the plants eight feet apart in the rows. This gives room between the rows for cultivation and harvesting, and room to turn at the ends of the fields, also ditches. The plants in the rows will throw so much shade that cultivation will be materially lessened for the third year, or eliminated entirely, for the bananas will come near taking

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Not Worried About Over-production

The shipping season just closing accomplished the widest distribution of Florida citrus fruits in the history of the industry here, according to F. L. Skelly, manager of the American Fruit Growers Inc., Orlando Division, in connection with a tabulation of results of the season for that organization.

Mr. Skelly showed the American Fruit Growers Inc. to have made carload sales during the past season in a great many smaller cities in the U. S. and in Canada where previously Florida citrus fruits had never been sold in carload lots. Included also were carload sales to the Philippine Islands and to Cape Breton Island off Nova Scotia. Numerous less than carload shipments at frequent intervals to France and to the British Isles were cited as indicative of a possibly widening field abroad at some future time when foreign exchange is better adjusted, though being relatively unimportant at present. In addition to the known performance of their own organization, Mr. Skelly credited other sales organizations handling Florida citrus fruits also with a considerably enlarged distribution this season, the total resulting, in his opinion, in by far the widest distribution of Florida oranges and grapefruit yet known.

Analyzing the production of grapefruit, particularly in Florida, Mr. Skelly refuses to be exercised concerning any possible overproduction of good quality grapefruit in the immediate future. Figuring the total amount of grapefruit sold in the U. S. at present at approximately twenty thousand carloads a year, he extends his figures to show this means less than four individual grapefruit yearly per capita for the population of the continental United States.

That the production and consumption of oranges at present is vastly greater than of grapefruit is shown by the sale of approximately eighty thousand carloads of oranges in this country in a year. This volume, together with the much greater number of fruit in each box, means the consumption of approximately forty-three oranges yearly for each person in the continental United States. Yet the continued increase in the production of oranges, in Mr. Skelly's opinion, is not a cause for alarm, as indicating any early over-production of good fruit. He expressed the hope that before long transportation interests may be disposed to grant some reduction in the carrying charges of Florida citrus fruits, which are now at fifty per cent above the pre-war level. In that event he believes the lower prices thus made possible to northern consumers will greatly expand the consumption of such fruits by making them available to a great many who would use them freely but who cannot afford to at the present level of prices.

Shipments from Florida by the American Fruit Growers Inc. showed a substantial increase in volume as compared to the previous season's business; and very large increase as against two years ago. The growth of the organization in Florida since it began business here four years ago has been very rapid. The outlook for further and larger increases next season was stated to be excellent. The statement was made that in proportion to the number of owned and affiliated packing houses in actual operation the American Fruit Growers Inc. had done practically a capacity business this season.

It was announced that several new packing houses will be opened in Florida for the next shipping season. But as locations for the sites of some of these are still in process of negotiation no specific locations were given. It was said that next season's advertising in the North for Florida citrus fruits by the American Fruit Growers Inc., will be considerably amplified and expanded in order to keep pace with the increasing volume of business, and to prepare for the still greater increases anticipated. As heretofore, chief reliance will be placed in the liberal use of newspaper space in newspapers published in the consuming centers. Elevated railroad and subway advertising in the very largest cities will be used to some extent, but only as auxiliary to the main effort in the newspapers, which it is felt are the most effective and economical agents in selling consumers on the value of fruits in the diet, the particular value of fruits sold under the Blue Goose trademark, and the easy method of distinguishing such fruits by that very distinctive trademark which is clearly branded upon each individual fruit. The AFG trademark, which appears on fruit of good eating quality, but of insufficient appearance to warrant being designated by the Blue Goose trademark, will be similarly exploited. It is felt that the same advertising policies and style of advertising copy which have been so tremendously successful in putting the Blue Goose trademark in the front ranks of trademarked goods for the home deserve to be continued without any marked modification.

Mr. Skelly gave it as his opinion that this season, while presenting some difficulties from a selling standpoint, had on the whole been eminently satisfactory to the growers served by the organization. The policy of basing the great majority of shipments upon f. o. b. orders was declared to have been demonstrated as of the greatest worth to the growers, while sending to the auction markets only fruit especially desirable for such markets was said to have obtained results very gratifying to the growers to whom the fruit belonged.

A. B. Michael of Wabasso, regional vice-president of the American Fruit Growers Inc., confirmed Mr. Skelly by stating that while the general average of prices over the state this season had been lower than those of last season, it had been found that the average prices for Blue Goose oranges and grapefruit from his own section, the Indian river, actually had been higher than those for last season. He attributed this to the volume of shipments, practically one-half of the Indian River citrus fruits this season having been handled by the American Fruit Growers Inc., and to the growth in popularity with the fruit trade of the policies and packing methods employed. He said that during this, the fourth, season of operations there under these policies, the increasing confidence of the trade was to be noted readily; and that the cumulative effect of the Blue Goose advertising was reported to be reflected by a strongly increased consumer demand which moved the fruit out into consumption very quickly. The noticeable result was that during a good part of the season it was very difficult to obtain a sufficient quantity of fruit meeting the Blue Goose grade requirements to supply the demand.

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Grove Problems

(This Department is in Charge of Mr. L. D. Niles, of Lucerne Park, Fla., who will gladly answer all legitimate grove problems submitted by readers of The Citrus Industry.)

Question: I contracted the planting of some 500 to 600 trees and now discover a pocket beneath almost every tree. Dirt was not filled, or washed, in under the tap roots. Often two quarts dirt can be worked down with the fingers. Will this affect the growth or bearing of the tree, present or future? Would you remedy it, and how? Enclosed find postage for a prompt reply, with thanks in advance. E. E. J., Orlando.

Answer: A successful farmer or trucker takes a great deal of pains in preparing his seed-bed, well aware that the success of his crop depends, to a large degree, on thorough preparation of the ground. In grove planting the same principle applies; often the difference between success and failure lies in thorough preparation and careful handling and planting of the trees.

There is only one way to do this: get down on your knees and use your hands to place each root in its natural position, packing the dirt well around the tap root and under the branch roots, afterwards settling the dirt with plenty of water. Then pack until tree is solid, then bank or cover the wet soil with dry sand.

If there is an air space around the roots it will most certainly affect the growth of the trees and it would not be surprising if many of yours are not already dead. If your contractor is responsible, would suggest having him repair the damage. If not, and you have to remedy the trouble yourself, would suggest heavy watering, shaking the tree to help fill the air-space as water settles, afterward packing well. Would like to hear results.

Trouble With Mowers

Question: A very serious grove problem with us has been trouble with our mowing machines; have the same kind of machines that we used in Illinois for cutting hay, but the men are always having trouble—blades break, parts wear out so quickly, even when well oiled, and the sand just seems to get in every bearing, which, of course, soon cuts them out. What I want to know is whether there is another type of machine that will stand up in this sandy country or whether it would not be best to stop trying to mow and use the disk in the fall to subdue the cover crop before plowing. Which would you consider the best grove practice? H. K. W.

Answer: While Norfolk fine sand is ideal for growing citrus, it certainly causes mischief when mixed with grease and finds its way between moving metal, every part where friction occurs soon wears out. With the type of machine you are using, think your only chance of relief would be to cover all bearings and open gears to help protect from sand; sometime a heavy canvas fitted over unprotected gears will help. It is very important that the cutter bar should be raised high enough to keep it free from sand; if the shoe at each end of cutter bar will not raise it high enough, have a blacksmith make one, or a wooden shoe, home-made, can be used with good results. However, several machines are now manufactured which are more nearly sand-proof; one which is giving satisfactory results is also made with changeable speed, high and low, the slow speed being sufficient for ordinary grove work is consequently easier on both team and machine. Generally when knife bars break it is caused by worn wearing plates or from the cutter bar being out of alignment. Regarding your proposal to stop using mower, would say that I consider the mowing machine one of the most important implements for grove cultivation. Cutting your cover crop at least three times during the season and leaving it on the ground is an excellent way to add humus, build up your soil and also greatly helps in the control of all leaf eating insects, pumpkin bugs, etc.

Avocado Problems

Question: Inclosed I am sending leaves from three of my avocado trees. These trees are about three years old, do not know the name as tags have been lost, but we planted some Mexican, Trapps and a few Guatemalan. Is there any way of knowing the kind of trees these are and what kind of insect is on one of the leaves and what should I do for it, if it is serious? Several of the trees had a little bloom this spring, but no fruit on trees now. R. D. L.

Answer: From the leaves enclosed would say that they are apparently Guatemalan and Mexican, the largest leaf while unusually large for Mexican has a distinct anise odor which is typical peculiarity of the Mexican variety. It is not surprising that fruit did not set this past dry spring, but from appearance of the leaves your trees are in good condition and should bear a small crop next year, and while such fruit is on the trees it will be easy to distinguish the varieties and mark the trees. The scale on one leaf in adult stage is the shield or pyriform scale, the larger ones showing the cottony appearance being the female with eggs just at the point of hatching. However, find this scale on two other leaves in a younger stage, and would suggest that the trees be sprayed with a good insecticide, at least one per cent oil; with a second application about three weeks later, this scale being very hard to kill in the adult stage.

When to Spray

Question: I expect spraying crew here May 30th to spray my citrus trees around the house. Now, they will be about in full bloom at that time. Is it safe to spray with Fico 60 when in that condition? F. B. W., Winter Haven.

Answer: If you use insecticide strong enough to kill scale or white fly larvae when tree is in full bloom the chances are you will severely burn new growth and injure bloom also. Better wait until fruit from this new bloom is nearly one inch in in diameter before spraying with oil.

The numerous rains we have been getting lately, following the dry winter and spring, undoubtedly will cause quite a heavy bloom in certain groves. This May bloom should produce good quality fruit if well taken care of; however, this complicates our regular grove practices somewhat as we have just shown in spraying. In this case, one setting of fruit and perhaps the scale and larval stage being right for spray control, but the bloom and growth conditions being such that it is unsafe to spray with oil. This condition further will give cause for study to the owner who is trying to make the most from his grove property and he will consider what will best assist him in producing quality fruit from this late bloom and at the same time keep the first bloom fruit in best possible condition. Perhaps individual trees should receive extra attention, possibly an extra allowance of fertilizer would help some individual tree. Is the pruning practice good (opinions vary here); arrangements made for cutting the cover crop; are you carrying a good magnifying glass to help watch for rust mite movement? These are a few of the things to keep in mind if one is trying for quality fruit, which is undoubtedly where the difference between success and failure will lie in the future.

Ross and Walker Chosen

Dr. J. H. Ross, of Winter Haven, was reelected, for the 12th consecutive term, president of the Florida Citrus Exchange at the annual meeting of that organization at Tampa recently. Other officers elected were: D. C. Gillette, Tampa, first vice-president; Capt. F. W. C. Kramer, Leesburg, second vice-president; C. E. Stewart, Jr., business manager; W. T. Covode, cashier.

Old Board Retires

The old board, convening at nine o'clock, completed unfinished business and adjourned sine die. Dr. Ross complimented the retiring board on its close attention to detail incident to the management of the organization. He stated that, in his many years of experience, no body of men had shown greater appreciation of their responsibilities and loyalty to their duties in furthering the principle of cooperative marketing.

The meeting of the new board, convening at 10 o'clock, was attended by the following directors, representing various sub-exchanges: A. F. Wyman, Bradentown, Manatee; Judge L. M. Hammel, Wauchula, DeSoto county; C. J. Stubbs, Fort Myers, Lee county; E. P. Livermore, Homestead, Dade county; Capt. F. C. W. Kramer, Leesburg, Highlands; John A. Snively, Florence Villa, Polk county; Senator H. G. Putnam, Oak Hill, Indian River; L. W. Tilden, Tildenville, Orange county.

Dr. J. H. Ross, as president, is director from the state at large. Directors D. C. Gillette and W. R. Lee were absent.

Ross Thanks Colleagues

"With a purpose that is wholly unselfish, and without profit to itself or to its members, except as all of the growers of Florida profit," said Dr. Ross, "offering equal opportunities for every grower, no business organization in Florida occupies a higher place than the Florida Citrus Exchange. Its work as the leading organization in Florida, standing for the advancement of the state's greatest industry, is recognized by such bodies as the Bankers' Association of the state, and is extended the closest cooperation by the national government.

"In stress of war," continued Dr. Ross, "our problems as growers were given every due consideration. You can conduct a war without citrus fruit, but in times of peace mankind cannot live rightly and properly without the use of citrus fruit.

"In discharging our purpose and our duty in marketing the crop of the growers of Florida, we have been able to enlist the sympathy of the national government in our presentation of the human appeal of the welfare of Florida growers and the value to the nation of the product which they produce."

Dr. Ross pointed out the serious necessity of the Florida Citrus Exchange conducting its carefully worked-out policies for the development of the industry, for the protection of the interests of the producers of the state.

Organization of the Exchange Supply Company for the coming year was effected at the annual stockholders' meeting in Tampa by the election of a new board of directors and subsequent reelection of all officers except the general manager.

C. H. Walker, of Bartow, who has for a number of years been manager of the Polk County Citrus Sub-Exchange, was unanimously elected by the new board as general manager, succeeding W. F. Miller. Mr. Miller tendered his resignation two weeks ago, owing to the increased attention required of him by his private interests.

Dr. J. H. Ross, of Winter Haven, who is also presient of the Florida Citrus Exchange, was reelected as president of the Exchange Supply Company. Other officers reelected were: D. C. Gillett, vice-president; C. E. Stewart, secretary-treasurer; L. B. Giles, assistant secretary-treasurer.

CHAS. H. WALKER

The stockholders' meeting convened at 10 o'clock with representatives of 93 per cent of the stockholders present. General Manager Miller gave a detailed report of the operation of the company this past year, which was supplemented by an address by Dr. Ross on some of the fundamentals governing the work of the organization and its service of achievement for the co-operative citrus growers of Florida.

Organizing for the coming year, the stockholders decided to increase the membership of the board of directors from twelve to fifteen. A committee consisting of L. W. Tilden, Rupert Smith and A. F. Wyman was directed to prepare nominations for directors. This committee's report was unanimously accepted, and the following directors elected:

Dr. J. H. Ross, at large; W. R. Lee, Marion Sub-Exchange; F. C. W. Kramer, Highland Sub-Exchange; E. M. Berry and P. C. Peters, Orange Sub-Exchange; H. V. Pay, Volusia Sub-Exchange; H. G. Putnam, Indian River Sub-Exchange; E. P. Livermore, Dade Sub-Exchange; H. E. Cornell, J. A. Snively and A. V. Anderson, Polk Sub-Exchange; A. J. Dozier, DeSoto Sub-Exchange; W. W. Raymond, Lee Sub-Exchange; J. H. Yohe, Manatee Sub-Exchange; D. C. Gillett, Hillsboro Sub-Exchange.

The new board of directors proceeded to organize immediately upon the adjournment of the stockholders' meeting. After electing its officers it chose the following seven of its members to serve as an executive committee; F. C. W. Kramer, H. E. Cornell, A. J. Dozier, J. A. Snively, A. V. Anderson, J. H. Yohe and P. C. Peters.

Activities of the Exchange Supply Company during the past year, its accomplishments in affording cooperative grower-members of the Florida Citrus Exchange a real cooperative purchasing plan for buying their supplies in wholesale quantities and some of the problems which have confronted its management, were set forth in detail in the report of the retiring manager, Mr. Miller. He declared the company was in a strong financial position, and its prospects for future business bright.

Dr. Ross's remarks dealt with the great responsibility and the wonderful opportunities the directors of the Exchange Supply Company had in building up the organization's service for cooperative growers to a greater efficiency. He briefly reviewed factors which have affected the company and told of the need for united cooperation on the part of all Exchangs organizations it serves.

In taking office as general manager, Mr. Walker called upon the directors to give him their earnest support and to put forth some real effort on their part in working out the problems and enlarging the service of the Exchange Supply Company.

Several matters of business were postponed pending the consideration and recommendations of the new manager. The next meeting of the directors will be held here June 28.

But I say, he that soweth sparingly shall also reap sparingly, and he that soweth abundantly shall also reap abundantly.—II Corinthians, 9:6.

Four Farm Secrets

By Chas. F. Seabrook, in Farm and Fireside

The editor of Farm and Fireside has asked me to give you the secrets of the success of Seabrook Farms—to talk about the things which might be helpful to Farm and Fireside readers, even though they are engaged in a different kind of farming from that which we are doing on our 4,000 acres of vegetables, fruits, and general farm crops at Bridgeton, New Jersey.

I have been asked so often to give the secret of how to do it!! Well, so far as I have been able to discover, "there isn't any such animal."

There may be a few general principles which, if put to work, **and kept at work,** will make success reasonably certain, but there is nothing secret about those principles. They are just as plain and commonplace as the dirt under your feet; but, like the dirt, they won't "produce" unless you **make** them produce.

Now, if I were to try to boil down the results of my own experience to a formula, a set of rules, to apply to any farm, anywhere, I think I would set them up about as follows:

First: Plan to follow a type of farming suitable to your own local conditions—don't start out with the idea that you can succeed by trying to imitate the success which some one else has made under entirely different circumstances.

Second: Attempt to do only as much as you are prepared and equipped to do in the best possible way; remember, it is not your gross receipts, but your gross receipts divided by the number of acres you cultivate, that will determine whether your farming will show a profit.

Third: Whatever you undertake, think it through, in every detail, before you start, and follow it through, personally, in every detail, after you start it. The first nine-tenths of the job of producing a crop involves the **spending** of money and time; and so if there is any break-down, even at the very end, in harvesting or marketing, you have nothing but a loss on your hands.

Fourth: Keep in mind that the basis of production in farming is **land.** Keep all your land producing something all the time. It is the idle, unproductive, boarder acres that often make the difference between profit and loss at the end of the season.

Now, these suggestions may seem, at first glance, too simple and commonplace to be of much use. You would probably be much more interested if I should attempt to tell you about some wonderful discovery that would increase your crops 100 per cent. If I knew of such a thing I would be glad to pass it along, but I have never been able to find any for my own use. If you should come down to Seabrook Farms, you would find us using the same kinds of manure and fertilizers, and very much the same methods of planting and cultivating and harvesting, that almost every wide-awake farmer uses.

But just stop and look around you, and see if you know of a single farmer who has failed where one or more of the four simple rules suggested above has not been ignored. And, on the other hand, see if you know of any case where these rules have been applied, without a fair degree of success having followed.

Let's look first at the last of these suggestions—keeping every acre working all the time. That is something that every farmer, anywhere, can start doing at any time, and with little or no additional expense or investment—except in thought.

We hear a lot about boarder cows and boarder hens, why doesn't somebody get on the trail of the boarder acre?

On Seabrook Farms we have no boarder acres. Often, as a matter of curiosity, I have asked visitors what they found to be the most noticeable difference between our place and the average farm, and the great majority answer: "The fact that it is so intensively worked, no weeds, no idle fields, no fence corners, every foot of soil producing something."

It is true that all our fields come right up to the roadsides; we do not even waste headlands to turn our horses and machines on. The roads are laid out at right angles, and the fields are square-cornered. But all this did not just happen so. The land that now comprises Seabrook Farms was originally in many farms—some large, many very small. All this land carried, when we bought it, more or less of an unproductive overhead load of useless or unused fence rows, headlands, fence corners, and small or inaccessible fields—**and this load had been carried for many generations.**

When we add a farm to our holdings, our very first step is to square it up; and that phrase has a very literal meaning.

We usually find several acres right around the house, by cleaning out old fruit trees that haven't borne any fruit worth gathering since anyone can remember, but left there year after year, occupying the most valuable—because the most accessible—place on the farm. How many places do you know where one or two, or even four or five, acres, right around the house, are taken up with un-cared-for fruit trees, small fenced-off, weed-grown plots, and tumble-down useless outbuildings, that never produce a dollar's worth of revenue for the farm? Why not clean up these boarder acres and put them to work?

It would not be desirable, even if it were possible, to attempt to outline here the various crops for the different locations and conditions which could be utilized to keep these loafing acres busy. The point is that there are such crops, well adapted to any combination of soil, season, or climate, which can be found and put to work. These crops are of two kinds: first, those which can be utilized to produce a cash return; and, secondly, those which can be employed when the ground is not being used for the regular cash crops, to improve its condition and add to the plant food in it, which later can be turned into a cash crop. The second class is no less important than the first. On our own extensive orchards, and even on the fields which are used to produce two or three crops of vegetables, we put in a cover crop for the winter immediately after the harvesting of the last crop—immediately meaning, under usual conditions, within twenty-four hours.

In the older blocks of the orchards, where the trees need all the room, a summer crop is grown after the winter cover crop is plowed under. Where the trees are smaller, the space between the trees is used for some vegetable crop such as lima beans, peas or turnips. From most of this land we get two crops a season between the trees.

In short, the important thing is merely to **settle definitely on a fixed policy of keeping every acre busy all the time,** and then the details of what to plant can easily be worked out.

Now a word as to the importance of following the kind of farming suitable to your own local conditions. You know the type of farmer who is always trying something new. His idea is to beat the game by plunging into something that he has heard

Continued on Page 24

Summer Planting Time Is Here

THE WISE GROWER WILL TAKE ADVANTAGE OF PRESENT CONDITIONS TO INCREASE ACREAGE

We have a complete line of citrus nursery stock in every line—all sizes and all varieties on rough lemon and sour orange stock. We can fill your order for any quantity.
ORANGES—Parson Brown, Pineapple, Lue Gim Gong, Tardiff, Valencia and Dancy Tangerines.
GRAPEFRUIT—Walters, Excelsior and Marsh Seedless.

AVOCADOS THE COMING MONEY CROP OF SOUTH FLORIDA

Avocado trees planted now will get the benefit of the summer growing season, and the grower who plants now will be just that much nearer the profit-earning returns from his young grove than the one who waits until the winter season to plant his trees.
Wilson Popenoe, the government expert, says that avocado culture promises to become more important than citrus in Florida. The returns are quicker, the profits greater and the trees of the late and improved varieties are quite as hardy as the orange or the grapefruit. Will you be one of the pioneers to enjoy the first fruits of this rapidly growing industry?

Write us for Catalog and detailed planting information.

The C. E. Thomas Nurseries,

404½ Zack St.,

Phone 3692 Tampa, Florida

GENUINE PERUVIAN GUANO

The largest importation ever received from the Guano Islands direct to the state of Florida—an exclusive importation of the Nitrate Agencies Company.

Analysis:

12.5% Ammonia
10% Available Phosphoric Acid
3% Potash
Prices while vessel is discharging:
Bag lots—$4.00 per 100 lbs.
Ton lots—$78.00 per ton
Car lots—$76.00 per ton

NITRATE AGENCIES CO.
Jacksonville, Fla.
Fertilizers Insecticides

CONTROL
Rust Mites and Red Spider on Citrus by Dusting With

"ANCHOR" BRAND SUBLIMED VELVET FLOWERS OF SULPHUR 100% PURE.

Endorsed by National and State Authorities
"ANCHOR" BRAND will also be found to be the best control measure for Mildew, Red Spider, Brown Mite and Rust Mite on various grades and varieties of garden truck, grapes, strawberries, etc.
Dusting with "ANCHOR" BRAND SULPHUR will prove more economical and easier to apply than liquid sprays for controlling these pests. It is the highest grade of sulphur produced in the world and when blown on trees and plants forms a veritable cloud of impalpable powder, settling and adhering to every part of foliage and fruit. For the control of the above pests where SPRAYING is preferred, "ALFA" BRAND WETTABLE SULPHUR will prove highly efficient. This grade contains a higher quantity of sulphur (90%) than the average wettable sulphur. It will also be satisfactory for Brown Rot on peaches and Apple Scab. Our Wettable Sulphur readily mixes with cold water and can be combined with Nicotine or Arsenate of Lead with all these materials retaining their effectiveness.

Try "TORO" BRAND AGRICULTURAL COMPOUND for Yellowing or Dying-out of Citrus; also for Potato Scab, Alfalfa, repelling soil pests, etc.

STAUFFER CHEMICAL COMPANY OF TEXAS
711 Scanlan Bldg., Houston, Texas.

Florida Distributors:
Chase & Company, Sanford, Fla.
Exchange Supply Co. Tampa, Fla.
Florida Insecticide Co., Apopka, Fla.

Jacksonville's Leading Hotel

Strictly Fire Proof. In the center of everything.

Rates:
With private bath $2 50 up. Without bath $2 up

HOTEL SEMINOLE
Chas. B. Griner, Manager
Jacksonville, Fla.

NOT WORRIED ABOUT OVER-PRODUCTION

Continued from page 19

He congratulated Mr. Skelly warmly upon the showing made by the sales organization. Senator J. H. Derby of Rockledge joined in felicitating the organization upon the showing made.

Summarizing preparations for handling next season's operations, Mr. Skelly indicated his belief that the crop would be the largest in Florida's history unless something unexpected intervenes, though he says it is yet too early to try to estimate it in figures of actual number of boxes. Coupled with this is the prospect for a heavy citrus yield in California also. The result, in his opinion, will be to emphasize the value of carefully packed and advertised fruit, and the necessity for distributing sales over the widest possible area.

He believes, however, that there will be a substantial and steady market for good fruit, and is optimistic as to the general outlook for Florida.

FOUR FARMING SECRETS

Continued from page 22

somebody else has made a success of.

As a general rule you will find that the crops being grown on the majority of the good farms in any section, and all things considered, are the most profitable crops to grow in that section. The safest and surest way to beat the game is not to try something new, but simply to grow these same things better than anybody else is doing it.

Another type of farmer that you often see fail is the fellow who "bites off more than he can chew." There is one thing that is always good to keep in mind: it is very easy to plant in the spring several times as much as can possibly be properly taken care of during the summer, or harvested and marketed in the fall. When you are laying out your plans, it is a good thing to figure from the end of the season backwards.

This brings us to the point of planning things through to the end before you start.

The average manufacturer has a pretty good idea where and at what price his product is going to be sold before he produces it. The average farmer has not. Our own general policy is, wherever possible, to sell a crop before we grow it. Of course we cannot always do that, and the average farmer cannot. But he could do much more than he generally does, at least to plan for the disposal of his crops in advance; and if he does that, as a fixed policy, he will average much better than if he trusts to luck and then sells when everybody is "dumping."

A FLY PAPER HOLDER MADE IN TWO MINUTES WITHOUT COST

A good fly paper holder can be made of cardboard. Cut a piece of heavy cardboard, or two or more thin sheets, 8 by 14 inches. Place sheet of Tanglefoot on cardboard, fasten four corners with wire paper clips. A half inch elevation in center of sheet increases the catch of flies. Bend up a piece ½ by 6 inches in cener of cardboard, lengthwise.

ANOTHER CANNING PLANT

Erection of a grapefruit canning factory by associations affiliated with the Indian River Citrus Sub-Exchange to be located at either Vero or Fort Pierce, is under consideration. Committees of the various associations are now engaged in investigating the project.

If you are interested in raising pigs, write to the College of Agriculture, Gainesville, and ask for Extension Bulletin 31.

Often it is wise to kill the roosters of the chicken yard in order to get them out of the way. Fewer are needed than realized, especially if egg production for food is the aim. Hens will lay without the rooster, and the eggs will be just as good for food and will keep much better. Kill the rooster as soon as he is beyond his usefulness, or keep him away from the hens.

Anthracnose causes enormous losses in the watermelon fields of Florida. Spray the vines and leaves with 4-4-50 Bordeaux mixture.

Celery can come out of the luxury class if all of the bunch is used. The green ends and leaves may be used to good advantage in soup.

A pound of lye to 40 gallons of water is a cheap and effective disinfectant to use in the hog- or the henhouse.

If a stitch in time saves nine, why won't a weed pulled in time save ninety and nine?

HOLDEN
Lime and Fertilizer Distributor
Handles All Kinds of Lime Rock and Fertilizer
Spreads 75 to 10,000 Pounds Per Acre.
The only successful lime and fertilizer distributor—saves time, labor and money. Handle fertilizer only once by hauling direct from cars to field. Patented Auger Force Feed—attaches to any wagon—no holes to bore. Spreads evenly 16½ feet wide, on hilly or level land. Simple and practical; no clogging or caking possible. Built strong—will give years of service. Hopper is level with bottom of wagon. Low in price.
Guaranteed To Handle Wet, Dry or Lumpy Lime (In Any Form), Commercial Fertilizer, Phosphate, Gypsum, Wood Ashes, Crushed Shells, etc.
Put this distributor to every test—you run no risk. The Holden Lime and Fertilizer Distributor is guaranteed to do all that is claimed for it or you may send it back and your money will be refunded. Thousands now in use—a proven success in all sections of the country. Write TODAY for full particulars.
DEALERS WANTED
The Holden Co., Inc.
220 Olive St., Peoria, Ill.
Distributors:
Florida Agricultural Supply Company
Jacksonville
Spreads 16½ Feet

The Citrus Fruit Crop of 1923-1924

Promises to be the largest in the history of the state. If the Growers and Packers will co-operate fully with their sales departments the results will be good. Growers who are making every effort to produce better fruit and Packers who are carefully grading and packing their fruit are helping their sales-managers to get better results.

The BOX is the main link in the chain of marketing citrus fruit. It is the last step in the packing operation. If it fails, it means loss to all interested.

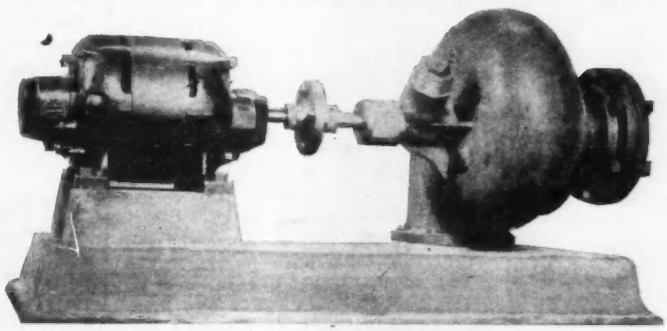
Can the Growers or Shippers afford to use anything but a well built attractive box

WE MANUFACTURE ONLY HIGH GRADE SCIENTIFICALLY CONSTRUCTED CRATE MATERIAL.

THE BEST BY TEST, AS THE SHIPPERS WHO ARE USING IT SAY.

Nocatee Crate Company
Nocatee, Fla.

Manatee Crate Company
Manatee, Fla.



Electric Lights, Irrigation, Running Water---No Expense for Operation

The Couch Hydro-Electric Unit (illustrated above) is the result of several years' study, research and experimental work to produce a compact, noiseless, and efficient Hydro-Electric Plant for use in connection with artesian wells or other sources of water power.

This Unit is designed to operate at 600 to 800 R. P. M. on heads from eight to twenty feet or more, consequently there is ample pressure left for all domestic purposes.

Turbine parts are not affected by salt or sulphur water. The volume of water used in these turbines is usually about one-third of the open flow of an artesian well.

Turbine is direct-connected to generator by a flexible self-aligning coupling, which allows the armature of the generator to assume its proper magnetic centers. Both turbine and generator are mounted on one cast iron base as a unit.

We manufacture these Hydro-Electric Units in capacities from 150 watts up in either 32 or 110 volts, for use on 3-inch wells or larger, or on other sources of water power.

Installation of these units is a very easy matter, due to their unit construction.

The suction head of draft tube or drain is practically equal to head pressure, so that the units can be located well above the tail race without sacrificing any power.

LET YOUR ARTESIAN WELL ILLUMINATE AS WELL AS IRRIGATE

Manufactured in any size, to give service to small and large homes, hotels and even entire resorts.

J. M. KEELY SUPPLY COMPANY

TAMPA — Distributors Manufactured by — FLORIDA

COUCH MANUFACTURING CO., GRANT, FLA.
Dealers Wanted in Every County in Florida

Spraying for Rust Mites and Scale Insects Following Spraying for Melanose

By W. W. Yothers, Bureau of Entomology, and J. R. Winston, Bureau of Plant Industry

The excellent results in preventing melanose obtained by many citrus growers last year have largely influenced a great many other growers to use the combination Bordeaux-oil emulsion spray this season. Of the hundreds of acres sprayed with this combination last year, only a very small percentage showed disastrous results. In one instance no follow-up spraying for either rust mites or scale insects was done, and as a logical result the fruit was very nearly unmarketable.

Where the Bordeaux-oil emulsion combination is used during the spring or early summer months, rust mites become somewhat more abundant than where it is not used. No doubt this is due to the action of the Bordeaux in preventing the development of what is presumed to be a fungus disease of rust mites. Since practically all growers who do any spraying at all spray during the last week in May or early June for rust mites, it may be unnecessary to caution them regarding the importance of this application. Wherever the Bordeaux-oil emulsion spray is used, however, it is imperative that a good spraying with lime-sulphur solution should be given some time from May 25 to June 10. Dusting with sulphur may be substituted for spraying, but two applications of the dust may be necessary in case the rain washes off the first application before the expiration of the third day.

When Bordeaux-oil emulsion is thoroughly applied during the last week in April or the first week in May for the control of melanose, white flies and scale insects are also controlled equally as effectively as when plain oil emulsion is used, thereby eliminating the necessity of the May application for these pests. In other words, this one application prevents melanose and controls white flies and scale insects. Furthermore, shadowing of the fruit does not follow this combination spray, as is sometimes the case when simple oil emulsion is used.

While it is true that this combination controls white flies and scale insects, these pests increase rapidly after its use, owing to the effect of the Bordeaux in the combination on the entomogenous fungi. In order to prevent any undue infestation of scale insects, a thorough spraying with straight oil emulsion of high efficiency should be given the last week in June or the first week in July. An application of oil emulsion at this time is extremely important and no grower should fail to make it. Such a spraying would reach the scale insects at a time when the largest percentage are in those stages that are most easily killed by the emulsion.

If it is possible to do so, an emulsion made of heavy oil, such as Atlantic Red or Nabob, should be used for this application. If the medium oils are used, it may be advisable to dilute them so that the spray material will contain approximately 1½ per cent of oil.

This oil emulsion spray should be most thoroughly and carefully applied, wetting all branches and leaves on both surfaces. If such a spraying is given in the proper way, and if the material is used at sufficient strength, little or no further injury from scale insects is likely to follow.

IF ANY COPPER SPRAYS HAVE BEEN USED DURING THE CURRENT YEAR, SPRAY JUNE 1 WITH SULPHUR FOR RUST MITES AND JUNE 25 WITH OIL EMULSION FOR SCALES.

An interesting educational exhibit in the halls of the "new" capitol building at Tallahassee is that of a number of jars and glasses of canned fish put put up by the home demonstration workers of the state. It consists of vegetable-fish stew (from red snapper), mullet roe, fish chowder, potted trout, crabs, red snapper flakes, pickled mullet and spiced mullet. Sampled, the eating was good.

The world may not owe any man a living, but it certainly does owe him the opportunity to make one—and the world usually pays its debts.

SKINNER SANDPROOF SPRAYER
"FOR BETTER SPRAYING"
The exclusive STRINE adjustable plunger makes its pump action more efficient, its life longer.
All Working Parts Incased in Oil; Sandproof
Strong, durable, easily handled. Excels in pressure and pumping capacity. Turns in 8 foot radius. Write for catalog today.
SKINNER MACHINERY CO.
Gulf Ave., Dunedin, Fla.
World's Largest Manufacturers of Fruit and Vegetable Packing Equipment.

VIRGINIA CAROLINA V-C Fertilizers CHEMICAL CO.

Service to Growers Built This Immense Business.

V-C Fertilizers come to you from the largest makers of fertilizers in the world. This big business was, and is, made possible only by superior V-C service, and the known dependability of V-C mixtures.

V-C formulas are calculated for every varied need in the care and cultivation of citrus trees. V-C experts are working constantly for the benefit and the advancement of citrus growing. The Florida division of this company is dedicated to the solution of Florida growing problems.

For nearly a quarter-century we have been serving the growers; and it is a matter of pride that many of the customers of the early years of our endeavor are today numbered among our best customers.

V-C Fertilizers aided largely in building their successes. Today they continue to rely upon them; and advise others to do likewise.

Write us your needs.

Virginia-Carolina Chemical Company
Florida Division
E. B. BROWN, Manager
Jacksonville, Fla.

VIRGINIA CAROLINA V-C Fertilizers CHEMICAL CO.

Better Supplies
FOR ORANGE PACKERS
For Less Money

The more attention you give to packaging your fruit, the larger profit you put in your pocket.

Pack your oranges in Merryday Boxes. These boxes are strong and attractive looking, because uniformly light in color. Made from selected short leaf pine, practically free from heart.

The clean, smooth, bright appearance of Merryday Orange Boxes attracts attention, interests buyers and helps you to get top-of-the-market prices. These quality boxes offer you superior packaging at lowered cost.

When you need Cypress field boxes, Galvanized iron field box strapping, Pearson's cement coated box nails, plain and printed Wraps, Parcel post boxes, or Spruce ladders, write us. We specialize in Orange Packers' Supplies and will be glad to quote you on your requirements.

W. A. Merryday Company

Palatka, Florida.

To Introduce to the Citrus Belt of Florida

We are authorized to sell 20 JOHNSON REX DUSTERS, equipped with the famous enclosed CUSHMAN engine, price $425.00, less 10 per cent, or $382.50 net cash Tampa.

These dusters will dust as many trees of any size as quickly and economically as any other duster offered in Florida.

We invite your inspection. Come and see these dusters in actual operation. Why pay more when you can get a duster that will do the work as well and as economically for much less?

When the 20 are sold, the price will then be approximately $425.00 net Tampa.

The Gulf Fertilizer Co.

Citizens Bank Building Tampa, Fla.

Canning and Preserving Fruits and Vegetables, 1921

The Department of Commerce announces that, according to reports made to the Bureau of the Census, the value of products of establishments engaged primarily in the canning and preserving of fruits and vegetables amounted to $248,105,000 in 1921, as compared with $402,242,000 in 1919 and $149,175,000 in 1914—a decrease of 38 per cent from 1919 to 1921, but an increase of 40 per cent for the seven-year period, 1914 to 1921. In addition to the amount shown for the classified industry, establishments assigned to other industry classifications reported canned fruits and vegetables as subsidiary products to the value of $7,351,000 in 1921; $12,932,000 in 1919; and $8,824,000 in 1914.

Statistics of establishments whose products of chief value were pickles, preserves and sauces are not included here, but have been given separately in a press notice under date of February 8.

The decreased production was due in part to general crop shortages in fruits and vegetables. The returns show that a large number of canneries were not operated at all during 1921, and others had not arranged for packing on the usual scale. This was due to market conditions and depression following the close of the war.

Of the 1,357 establishments reporting products valued at $5,000 and over in 1921, 802, or 59 per cent of the total number, were located in six states, as follows: California 229: Maryland 166; New York 139; Wisconsin 127; Maine 76; Indiana 65.

In September, the month of maximum employment, 95,535 wage earners were reported, and in January, the month of minimum employment, 9,849—the minimum representing ten per cent of the maximum. The average number employed during 1921 was 38,668, as compared with 60,865 in 1919 and 50,325 in 1914.

The statistics for 1921, 1919 and 1914 are summarized in the following statement. The figures for 1921 are preliminary and subject to such change and correction as may be found necessary from a further examination of the original reports.

	1921 1*	1919 1*	1914 1*
Number of establishments	1,357	2,343	1,779
Persons engaged	45,210	72,744	58,329
Proprietors and firm members	887	3,284	3,520
Salaried employees	5,655	8,595	4,484
Wage earners (average number)	38,668	60,865	50 325
Salaries and wages	$ 35,249,000	$ 56,943,000	$ 22,412,000
Salaries	10,444,000	13,351,000	5,107,000
Wages	24 805,000	43,592,000	17,305,000
Paid for contract work	558,000	329,000	422,000
Cost of materials	166,582,000	265,629,000	103,293,000
Value of products	248,105,000	402,242,000	149,175 000
Value added by manufacture 2*	81,523,000	136,613,000	45,882,000

1* Statistics for establishments with products valued at less than $5 000 are not included in the figures for 1921. There were 305 establishments of this class, reporting 495 wage earners and products valued at $701,000. For 1919, however, data for 739 establishments of this class, reporting 1,094 wage earners and products valued at $1,726,000, and for 1914, data for 1,374 such establishments, with 2,920 wage earners and products valued at $2,568 000, are included in all items with the exception of "number of establishments."

2* Value of products less cost of materials.

A student of human nature once said, "It takes us just about ten minutes to discover the same faults in others that we cannot discover in ourselves in a life time."

If you prefer not to clip your work animals, feed them bran mash once a week or a little linseed meal twice a week for three or four weeks. That hastens the shedding of the hair.

HOTEL HILLSBORO

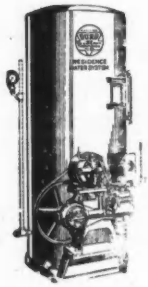
Tampa, Fla.

TOP O' THE TOWN

European Plan, Fireproof 300 Rooms With Baths

THE CENTER OF TAMPA

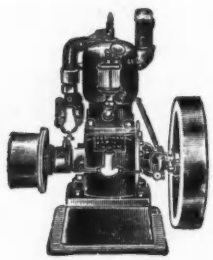
We specialize in water and light plants and irrigation systems. We make this our business and devote our entire time to it, therefore we believe we are especially equipped to render most efficient service in these lines.



Automatic water systems eliminating overhead tanks. Running water to all parts of your house and outbuildings.

We make complete installations of Water Systems, Electric Light plants and Irrigation Systems.

Lighting plant engines 1 1-2 to 20 h. p.



We carry a complete stock of 1½ to 20 horse power Engines, and can make immediate delivery and installation. Water systems in stock for immediate deliveries on all sizes.

Southern Water Supply Co.,

L. A. GABLE, Mgr.

807 Tampa St., Tampa

Distributors of
Cushman Engines
Cushman Light Plants
Duro Water Systems
Deming Pumping Systems
Home Light Plants

THERE'S A REASON FOR THE SMILE

Lee DeLuxe Cords

The Lee DeLuxe Cord Tire is the product of trained artisans working under conditions where haste and a slip-shod rush for volume production are never tolerated. Logical business sense prompts the manufacturer to give Lee Tire users the uttermost in value. From the selection and preparation of the raw material to its careful building layer by layer, each tire in the making is scrupulously inspected before the finished product is considered worthy of the brand it bears. The result is a tire of handsome symmetrical appearance with extra miles of service and reserve strength built into the carcass. Endurance and resiliency are produced by experienced rubber-blending in the tread and sidewalls, and in careful determination of the number of cord plies requisite for each tire size.

Ask the Lee Dealer in Your Town

LEE TIRE COMPANY of FLORIDA, Inc.

Tampa **Jacksonville**

LEE CORDS—"SMILE AT MILES"

To New York and Return
Summer Excursion Fare
$59.18

Tickets on sale until September 30th. Good returning as late as October 31st.
Steamers Scheduled to Sail Every Monday, Thursday and Saturday, at 2 p. m., as Follows:

(CALLING AT CHARLESTON, S. C.)

S. S. APACHE	June 4, 14, 23	July 2, 12, 21, 30
S. S. COMANCHE	June 7, 16, 25	July 5, 14, 23
S. S. LENAPE	June 9, 18, 28	July 7, 16, 26
S. S. ARAPAHOE	June 2, 11, 21, 30	July 9, 19, 28

JACKSONVILLE TO CHARLESTON AND RETURN, $18.00

Fares include meals and stateroom berth. Suites with private baths, some with double bed, others with twin beds, or, staterooms with connecting private lavatory without bath, or, large family rooms accommodating 3 and 4 people, may be obtained at additional cost varying according to location, size, etc.

St. JOHNS RIVER TRIPS BETWEEN SANFORD AND JACKSONVILLE
Round Trip in Either Direction
FARE $10.00 INCLUDING MEALS AND BERTH

For Reservations and Further Information Apply to

CLYDE LINE

H. C. Wenzel, Gen. So. Pass. Agt., Jacksonville, Fla.

BIOLOGICAL CONTROL OF BLACK SCALE

Continued from page 15

appendage through which the eggs are passed—under the edge of the shell of the host, turns this organ upwards and pushes through the under side of the host's body.

The time elapsing from the egg period to the adult stage of the parasite is from twenty-eight to thirty days in the insectary, when a temperature of about eighty-five degrees is maintained. In the field the period is considerably longer, but this, of course, depends upon climatic conditions. When the eggs hatch out the scales turn a brown color. As has already been stated, the larvae hatching from the eggs work upon the vital juices of the host, transform, and when ready to emerge eat a small hole in the skeleton of the host, always near the top. The exit is about the size of an ordinary pin head.

The Scutellista, popularly known as "Scuts," are small metallic blue parasites measuring about one-eighth of an inch when fully matured. They lay their eggs in the egg masses of the scales which are in a lower chamber than the scale body. On hatching, the young larvae feed upon the scale eggs for about fifteen days, when they pupate for a further period of the same time, and transform to adults, emerging through holes slightly smaller than those made by the Aphycus. The exit holes of the "scuts" are always in the lower portion of the scale. When, therefore, one sees dried-up brown scales with punctures in them one can immediately tell whether they have been parasitized by Scutellista or Aphycus.

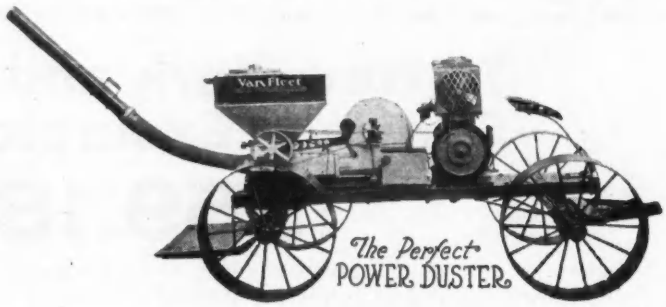
The Rhizobius ventralis belong to the Coccinellidae, the same family to which the more common ladybirds and are of a black color which is not very apparent to the naked eye, as belong. The Rhizobius are slightly smaller than the common ladybirds, they are covered with fine hairs which give them the appearance of being smothered with dust. When fully matured they measure about one-quarter of an inch. The larvae and adults feed upon the eggs of the black scale, and also upon the young or "rubber."

In the streets of California many pepper trees (Schinus molle) are being utilized as shade trees, and these can often be found almost covered with black scale. One pest control association collects "brush," i. e. stems and twigs of these trees on which the scale is particularly thick, and, as much as possible, in the adult stage. This is then taken into the insectary, cut up into suitably sized pieces, and placed on racks in rooms which are lined with tarred paper, and the windows of which are covered with fine cheesecloth. A temperature of eighty to eighty-five degrees is kept up by means of an oil stove in the center of the room, and a pan of water is kept on the top of this in order to keep the atmosphere moist, so that the brush will not dry too rapidly. As the Aphycus, Scutellista and Rhizobius emerge they fly to the light, and remain in the cheesecloth over the windows. Collectors then catch them by means of a small phial in the neck of which is a glass tube. This is placed over the insect and slightly moved, causing the parasite to enter the phial. Fifty are collected in each bottle. A conservative estimate of the number caught in one insectary room each day would be about two thousand. These insects are then taken into the citrus groves, where the black scale does most harm, and fifty are liberated on each tree. The shady side of the tree is chosen for the liberation, so that the parasites will be more likely to remain on it, the phial is turned upside down and knocked with the flat of the finger to shake every parasite out. The collectors are so expert when catching the parasites in the insectary that the different species, although minute, are kept quite separate. The liberated insects usually remain on the tree, parasitizing all the scales.

To return to the insectary side of the work: Potato plants are grown in boxes on shelves until the sprouts are about three inches high, and then pieces of twig that are thick with the scale are introduced into the boxes. The scales crawl onto the sprouts, lay auburn-colored eggs and quickly multiply. Into this room will be introduced the Aphycus and Scutellista, and they will at once attack the scale. In this way a breeding place is kept up, in order to have a continual supply of parasites on hand to meet any reasonable demand.

"We recommend the continuance of the scholarships maintained by this association in the agricultural section of the University of Florida."—State Bankers' Association.

The "Perfect" Power Duster



ANNOUNCING A NEW DUSTER

In announcing the "PERFECT" POWER DUSTER, we feel we have a product that will thoroughly meet the dusting requirements of Florida Growers.
Superior features of this machine will immediately recommend it to users of Dusting Machines.

SIMPLICITY	One of the principal features of the "PERFECT" is its simplicity
THE FAN	In the Fan we have made a distinct improvement over any other duster.
THE DUST HOPPER	Is built low and will contain 100 pounds of dust easily.
THE FEED CONTROL	Is conveniently arranged to the hand of the operator.
DEMONSTRATIONS	We will gladly give demonstrations to interested parties
THE GUARANTEE	These machines are made by expert workmen, and are guaranteed to give absolute satisfaction and the highest efficiency. Any parts found defective in material or workmanship will be replaced free of charge.

THE VAN FLEET CO.

Manufacturers and Distributors of
Spraying and Dusting Machines and Accessories

FLORENCE VILLA FLORIDA

CITRUS TREES

of Finest Quality and Bud Selection

This old established nursery has always propagated citrus trees of FINEST QUALITY, paying especial attention to bud selection and root system.

PLANT TREES FOR A PROFIT

If you want to plant citrus trees for a profit it will pay you to communicate with us.

GROWERS ATTEST QUALITY OF WARTMANN TREES

In all sections of Florida there are growers who attest to the superior quality of Wartmann trees.

THE WANURCO TANGERINE

A kid glove variety that surpasses all others in FLAVOR, JUICE CONTENT and SIZE.

The WANURCO ripens earlier, carries juice longer and is larger and better looking than any Tangerine now on the market.

WRITE FOR PRICE LIST AND COMPLETE INFORMATION ON THE FAMOUS WANURCO TANGERINE

The illustration shows a two-year-old WANURCO tree

WARTMANN NURSERY COMPANY
Ocala, Florida

Tirrell Air Sprayer

Eliminates pump repairs and cuts the cost of spraying in half.

Many satisfied Florida growers to whom we can refer you.

Can make prompt delivery. Also

"AMERICAN BEAUTY" HAND DUSTER

Without doubt the best duster on the market. Will cover trees 25 feet high. Write for complete data.

A COMPLETE LINE OF INSECTICIDES

Citrus Growers Supply Co.

303 Krause Bldg., **Tampa, Florida**

FOLLOWING AMERICAN PLAN

Fruit growers and exporters in South Africa are now firmly behind the cooperative movement, and are banded together in an organization controlling 86 per cent of the citrus and about 95 per cent of the deciduous fruit exports, says Consul Donald, Johannesburg, in a report just received by the Department of Commerce. The Fruit Growers' Cooperative Exchange of South Africa represents 31 cooperative companies with a membership of over 1,000 individual growers, indicating that the organization has become firmly established and is in a position to present a united front in such matters as shipping, harbor, and railway control, and advertising.

GOVERNMENT CANNERY TO FOLLOW OFFICIAL STORE

Serving the double purpose of bringing locally grown fruit to the attention of tourists and of raising revenue, the government of Trinidad has established a store at Port of Spain for the retail selling of oranges, grapefruit and mangoes. According to Consul Henry D. Baker, in a report to the Department of Commerce, it is the intention to cater specially to tourist trade and to the better class trade of the local public. It is later intended to establish fruit canning and preserving establishments to care for the excellent yields of native fruits.

For Bigger, Better Crops Use

BRADLEY'S FERTILIZERS

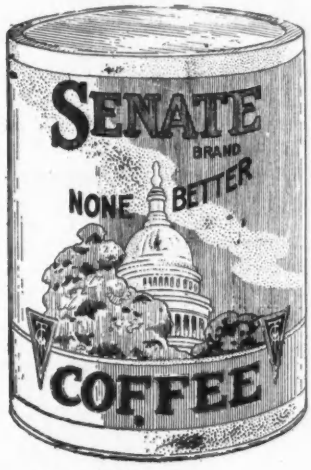
THE AMERICAN AGRICULTURAL CHEMICAL COMPANY · AA QUALITY · REG. U.S. PAT. OFF.

Built Up to a Standard Not Down to a Price

THE AMERICAN AGRICULTURAL CHEMICAL CO.

916 GRAHAM BLDG., JACKSONVILLE, FLA.

The Coffee With "The Taste That Satisfies"



SENATE

Coffee is sold by your Grocer

"NONE BETTER"

Tampa Coffee Mills, Manufacturers Tampa, Fla.

Ready

when you need it most

To be effective, spraying must be done not only when conditions are ripe, but with the proper equipment. Not to have a spray rig ready and powerful enough to do the job right is to risk a heavy loss.

The fruit grower whose sprayer is Hercules equipped has dependable spraying power—an engine that is guaranteed, that always gives a steady pressure of 200 to 250 pounds, and that will not go wrong when the job is half finished.

The cost of a Hercules equipped sprayer is no more than that of less dependable ones. In fact the initial price of the Hercules is less than that of most standard make engines.

There is a Hercules equipped sprayer that was designed for your grove—one for your farm. They range in size from 1½ H. P. up.

Whatever equipment you need—concrete mixers, hoists, grading machinery, saw rigs, pumps, etc.,—be sure that you get it equipped with dependable, guaranteed Hercules power.

We will gladly demonstrate the engine to you and tell you about Hercules equipped machinery. Or, write to us and let us give you the benefit of our experience in the solution of your power problems.

Coates Plumbing Supply Co.

Distributors Hercules Engines

TAMPA, FLORIDA

BANANA GROWING IN FLORIDA

Continued from page 18

possession by that time if everything is going well. I figured on fertilizer costing $40 per ton after freight, hauling and spreading are included. A half ton to the acre would require a total of five tons for ten acres. This is based on commercial or mixed fertilizers. If you use stable or dairy manures, and some commercial fertilizer to provide the phosphorus and potash, the costs will run about the same in the end.

The gross earnings from ten acres of bananas will be nothing the first year, and they should be $300 per acre, or $3,000, for the second year. If you have taken proper care all the way along, the gross receipts the third year should be at least $400 per acre, or $4,000. It is possible to make $500 to $800 gross per acre after the third year, which of course means $5,000 to $8,000 per year.

The cost of planting should not be stinted. The holes should be two feet six inches wide, the same distance long, and the same distance deep. This gives the set of roots which tends to go down straight, a chance to anchor deeply, and also gives the lateral sets of roots a chance to grow fast and get at the food in the soil easily.

Most of the failures everywhere in any line of agriculture are caused by lack of capital, lack of knowledge, lack of willingness to be thorough in doing the work. Ten acres in Florida, well cared for, would be better than twenty or even forty acres half-cared for, because the half-care usually means failure, no matter what the size of the farm.

I may be running the risk of getting myself into a lot of trouble, but I am still going to say I am willing to have people write and ask questions, and I will try to answer them all. It is my duty as secretary of the Florida Banana Growers' Association to promote the growth and usefulness of that association, and to advance the business of banana culture in Florida. I have a limited number of booklets issued by an agricultural society in the West Indies, and these I am willing to loan free of charge. They will be helpful to those who wish to go into the business of growing bananas in a large way in Florida.

MANY GROWERS USING DUST

The recent heavy and continued rains have tended to interfere with spraying operations for rust mite control to a considerable extent, and it is reported that this has had a tendency to cause many growers to turn to dusting as a means of holding the mites in check. The dust is applied while the foliage is wet and while the rains wash off some of the sulphur it is said that sufficient quantities are retained to hold the mites in check. Growers are applying the dust early in the morning or just following the showers.

IT'S BABSON PARK NOW

Change of the name of the Crooked Lake Citrus Growers' Association to the Babson Park Citrus Growers' Association, in accordance with the recent change in the name of this town, has been approved by the directors of that organization. A. H. Stafford, manager of the Lakeland-Highland Citrus Growers' Association of Haskell, has been selected as the new manager for the Babson Park Citrus Growers' Association, effective July 1.

The man who does all he can is always the man who tries to do more than he can.

Some folks don't stop to think that their thoughts and actions of today will be repeated by their children thru the years to come.

Seaboard Air Line

Announce Summer Tourist Rates

California : National Parks : Eastern Resorts : Carolinas

The Blue Ridge Mountains of Western North Carolina
IS A WONDERFUL VACATION SPOT

Cheap Summer Tourist rates are offered to ASHEVILLE, WAYNESVILLE, BLACK MOUNTAIN, HENDERSONVILLE, BREVARD, LAKE TOXOWAY and many other interesting points via the route of the

"LAND OF THE SKY SPECIAL"
Through Sleepers and Famous Seaboard Dining Car Service

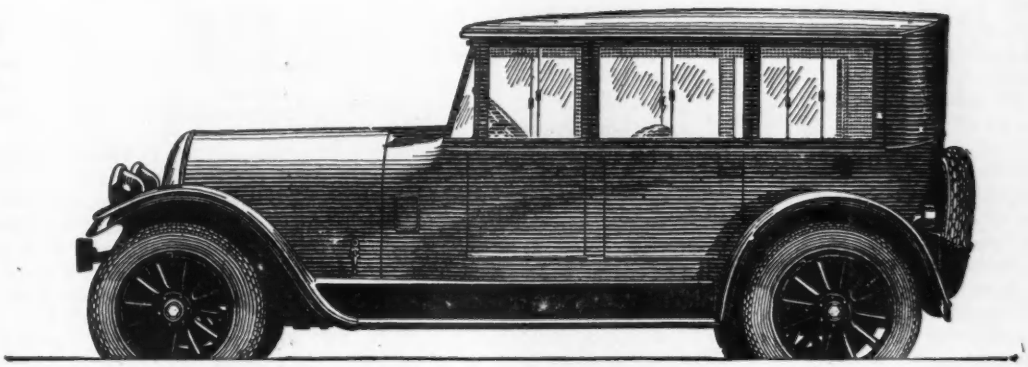
Cheap rates in effect from all South Florida points via Washington to Baltimore, Atlantic City, Niagara Falls, Philadelphia, New York, Boston, Buffalo, Toronto, Montreal and many other Summer Resorts.

LET US PLAN ITINERARY FOR YOUR SUMMER TRIP. Call on nearest TICKET AGENT, who will be glad of the opportunity to serve you, or write

R. H. ROLFE, District Passenger Agent, HILLSBORO HOTEL, TAMPA, FLA.

Seaboard Air Line Railway

FRANKLIN



The New Demi-Sedan $2250

f. o. b. Syracuse

A new kind of car with smart body of exclusive design and finest construction. It gives complete closed car comfort without the usual added weight —at a price little above an open car, and with no greater upkeep. Ventilation and degree of enclosure made easy to regulate by sliding plate-glass windows. Neither they nor the aluminum body can work loose and rattle. Upholstery of selected leather that wears indefinitely. Inlaid mountings that will never tarnish. Every Franklin performance advantage, includiug the powerful new six motor and pressure air cooling. For the active family, the Demi-Sedan fills the bill to perfection.

Owen-Franklin Motor Co., Tampa, Fla.

Franklin-Miami Co., Miami, Fla.

Franklin Motor Car Co., Orlando, Fla.

THE PRESENT STATUS OF SPRAYING AND DUSTING FOR THE CONTROL OF CITRUS DISEASES

Continued from page 9

I have been able to make on the use of the dust, it has given promising results in the control of the downy mildew on cucumbers.

It seems to give satisfactory results in most cases for the control of watermelon anthracnose. The results from dusting peppers this season have not been conclusive owing to the small amount of disease that appeared on this crop.

It is never safe to draw conclusions too quickly, especially from the results of a single season, however, it appears to me that there is a possibility in the use of dusts for the control of several of our important crop diseases. Perhaps a great deal more of experimenting and investigating needs to be done before a satisfactory dust is found, and I believe that exhaustive efforts will be directed along this line, since dusting is more popular than spraying with the average farmer.

If a dust will control certain diseases of other crops it seems to me we may expect it to have a similar effect on some of our citrus diseases.

PROTECT THE FIG TREE; SPRAY WITH BORDEAUX MIXTURE IN SUMMER

That fig tree in your back yard—and most back yards in Florida have a few such trees—needs to be sprayed with bordeaux mixture in order that a number of diseases, prevalent enough in this state to cause serious losses, be controlled.

There are a number of fungous diseases of the fig, all together causing losses hard to estimate, but one good application of properly prepared bordeaux mixture—4-4-50 formula—will help to control all of them, generally speaking, according to specialists of the Florida Experiment Station.

Among these diseases should be mentioned: First, anthracnose, a disease of the fruit and foliage, which causes a soft rotting and a dropping of the fruit. It may appear first as small, sunken and discolored areas which later increase in size and become covered with pink masses of spores. On the leaves the affected areas are sunken, gray, and often show the pink masses of spores in the center.

Second, fig rust is the most common disease of this fruit. The disease occurs on the leaves and mostly during the latter part of the summer. It is recognized by numerous small, raised, reddish-brown spots which are covered with a golden yellow powder on the under surface of the leaves.

Third, leaf blight causes fig leaves to shrivel and die. Compact silky threads can be observed on the young twigs and leaf petioles. This growth spreads over the blade of the leaf and causes it to turn brown where it joins the stem or petiole. Eventually it dies and falls off.

Spraying should be done early in the summer, and should help to control these diseases, providing it is applied well and not soon washed off by rains. Both sides of the leaves and all twigs and young fruit should be covered completely with the spray.

CHINESE GROWING ORANGES

Native Chinese orange groves throughout Foochow yielded a harvest of sixteen million pounds of tangerines during the season ending April, 1922, Consul Price, Foochow, informs the Department of Commerce. Practically all of these loose-skinned oranges were shipped to various parts of the Chinese empire.

ASSISTANT SALES MANAGER

L. B. Walden has been appointed assistant sales manager for Sealdheart canned grapefruit, packed by associations affiliated with the Florida Citrus Exchange, it is announced by C. E. Stewart, business manager of the Exchange. Mr. Walden has for three years been secretary to Mr. Stewart. Under his new appointment he will work in the Tampa office of George A. Scott, general sales manager.

A CORRECTION

In making mention last month of the flock of Rhode Island Red hens which made the great egg record, The Citrus Industry gave credit for the ownership to Mrs. L. A. Henry. The name should have been spelled Hendry, as the hens are the property of Mrs. L. A. Hendry of East Fort Myers.

Twenty Years of Experience

and close study of Florida soils and their needs, particularly as regards Citrus Crops, produced

BETTER QUALITY FERTILIZERS

They are right as to availability, sources and mechanical condition.

Write for further information.

Trueman Fertilizer Company

Jacksonville, Fla.

Agricultural Chemicals
Special Mixtures
Insecticide Materials

Something New In Grove Heating

The

Vlag Automatic Heater

Gives Protection That Protects

The VLAG Automatic Frost Protector is what the Citrus Growers have been waiting for. Here are some of the features that will immediately recommend it to the grove owner.

Will burn continuously regardless of weather conditions without any attention as long as the supply of oil lasts.

Absolutely dependable.

Oil containers of a capacity sufficient to keep the heater in operation from 20 to 50 hours; by replacing empty container with full one the heater is again ready for an additional 20 to 50 hours firing.

Oil containers can be changed without extinguishing the heater.

Can be lighted in one second.

Easily regulated to give any degree of heat desired up to its maximum capacity.

Produces no smoke.

Needs no cleaning for it does not accumulate carbon.

The actual performance of this heater has never been equalled by any grove or orchard heater on the market regardless of type or cost.

Radiates more heat than any other heater.

Heats closer to the ground.

Is absolutely water-proof.

Water in the oil has no detrimental effect on the performance of the heater

Because of greater heat radiation fewer heaters are needed per acre.

Guaranteed for ten years against rusting out or any defect in material or workmanship.

We are ready to prove our claims by demonstrating this heater in competition with any or all other types of orchard or grove heaters.

Phone, Write or Wire.

Manufactured by

Keller Heating Co., Oldsmar, Fla.

Agents

Piet Vlag, West Tampa

General Distributors

Large Volume of Fruits Sold at Auttion

Fruit and vegetable auctions have come to be an important factor in the marketing activities of this country, according to investigations recently completed by the United States Department of Agriculture. Combining, as they do, publicity, competitive bidding, a congress of buyers, concentration of commodities, expert salesmen, and a minimum of expense, their growth in the past ten years has been notable. Gross sales amounting to $42,000,000 in 1912 had increased to $65,000,000 by 1917 and to $148,000,000 in 1921.

Auction sales of fruit and vegetables are held daily or tri-weekly in Boston, New York, Newark, Philadelphia, Baltimore, Pittsburgh, Cincinnati, Cleveland, Detroit, Chicago, Minneapolis, St. Paul, St. Louis and New Orleans. The metropolitan population of these 14 cities is 21,940,655, or 40 per cent of the urban population of the United States.

New York City is the leading auction market in this country, having four large competing companies, whose sales in 1921 aggregated $66,446,715. Although a comparison of gross sales on a money basis is not so accurate as on a tonnage basis, Philadelphia ranked second with sales amounting to $17,842,918, Boston third with $16,171,433, and Chicago fourth with $11,940,056. Pittsburgh, St. Louis and Cleveland each sold over $5,000,000 worth of goods but the other seven cities ran below that amount. Each city's percentage of the total auction sales is shown in the following table:

	Volume	%
N. York & Newark	$67,802,566	45.92
Philadelphia	17,842,918	12.09
Boston	16,171,433	10.95
Chicago	11,940,056	8.09
Pittsburgh	6,283,010	4.26
St. Louis	5,977,518	4.05
Cleveland	5,609,242	3.80
Baltimore	4,872,368	3.30
Cincinnati	3,792,624	2.18
New Orleans	3,224,745	2.18
Detroit	2,697,178	1.86
Minneapolis and St. Paul	1,416,875	0.96
Total	$147,630,533	100.00

In eastern auctions the volume of domestic citrus sold is approximately one-third greater than the volume of deciduous fruits. In some auctions of the Middle West this situation is reversed, two of the companies selling deciduous fruits almost exclusively. More vegetables are sold at auction in New Orleans than in any other city, those ranking next in importance being New York, Boston and Philadelphia.

A noticeable feature of auctions is that the products handled are usually shipped from distant sections to compete with products grown nearer these large markets. California citrus and deciduous fruit is particularly heavy in volume. Florida citrus fruits is second in the quantity received, and Northwestern deciduous third. Foreign fruits from Spain, Italy, Cuba, the West Indies and South American points are received in large volume, including grapes, lemons, pineapples, grapefruit, bananas and oranges. New York City handles large shipments of Spanish onions. Chile and South Africa during the winter months send vegetables and deciduous fruits into the New York market for auction sale. Belgium and Holland also contribute to the volume.

The proportion of foreign products in relation to domestic products was as follows in 1921:

	Cars	Value
Domestic products	72,356	$129,262,753
Foreign products:		
Bananas	18,315	11,748,876
Others	4,685	6,618,904
Total	95,356	$147,630,533

The low point of auction sales is in January, when domestic citrus fruits, boxed apples, foreign citrus and dried fruits, and pineapples are the principal commodities offered. During the first five months of the year the volume steadily increases, reaching a small peak in June, when the early deciduous fruits appear in quantity. A noticeable decline usually follows in July before the volume climbs to the peak of the year in October under heavy citrus and deciduous fruit shipments, particularly the latter. After October the volume rapidly diminishes.

According to the study made by the department, there are certain conditions which must be fulfilled before a commodity can sell successfully at auction. For example, it must first attain the characteristics of an auction commodity. Briefly, these characteristics are (1) a reasonably constant supply in season, (2) well-graded, well-packed goods in uniform packages, (3) arrivals should be in car-lot quantities except early express shipments or lots out of cold storage, and (4) arrivals should be in sufficient quantity to permit of being handled at a minimum expense.

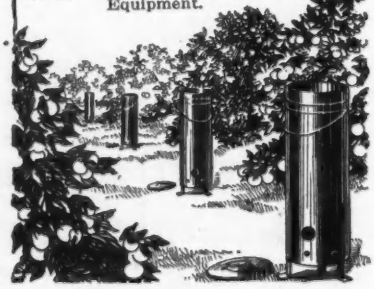
Among the more important products selling successfully at auction are the following: oranges, grapefruit, lemons, apples, apricots, bananas, cherries, cocoanuts, figs, onions, peaches, pears, pineapples, plums, prunes, cantaloupes, watermelons, cucumbers, garlic, lettuce, celery and tomatoes.

H. Harold Hume, President. Wm. P. Simmons, Vice-President
D. A. Morrison, Jr., Secty. & Treas.
BEST FERTILIZERS, INSECTICIDES, SPRAYERS, POULTRY SUPPLIES
Honest Goods, Fair Prices, Prompt Shipment. Ask your neighbor——He Knows
"Get new Fall Price List before Buying"
E. O. PAINTER FERTILIZER CO.
Jacksonville, Florida.

Play Safe

SKINNER COKE HEATERS have positively proven their effectiveness, in protecting Florida groves from damage by frost. Because of their efficiency, low first cost and economy of operation, they offer the very best means available for insuring citrus trees, fruit and truck crops against frost damage. SKINNER COKE HEATERS send out an intense radiant heat that frost can not penetrate, thereby protecting buds, blossoms and the tenderest growth. Write at once for full particulars.

Skinner Machinery Company
Gulf Avenue, Dunedin, Florida.
World's Largest Manufacturers of Fruit and Vegetable Packing Equipment.



REDUCED FARES

ROUND TRIP
To

BALTIMORE	$49.54
PHILADELPHIA	55.00
BOSTON	71.74

Including meals. Some staterooms have extra charge.

Tickets good to return until October 31. Through tickets to all points.

Plan a trip on the new steamships the "ALLEGHANY" or "BERKSHIRE." Automobiles carried.

Merchants & Miners Trans. Co.,
Pier 800 East Bay St
Telephone 638
Jacksonville, Florida

Be Prepared

To do effective Spraying use a BEAN POWER SPRAYER. You get more satisfaction with a BEAN.

Compare the Bean FEATURES "Point for Point" with those obtainable on other Sprayers.

1. **Bean Pressure Regulator:** This regulator is patented and used only on Bean Sprayers. With it the pressure is kept uniformly at desired point. Considerable fuel is saved, as well as wear and tear on pump. It is absolutely safe and dependable and makes possible the removal of any valve in the pump while full pressure is maintained on the air chamber and while Engine is in operation.

2. **Threadless Ball Valves:** These valves are large bell metal balls that work on reversible and removable seats. They revolve at each stroke of the pump plunger, preventing their sticking or corroding. The valve can be opened up entirely and every part removed in less than two minutes, without lowering the pressure, stopping engine or drawing liquid out of pump.

3. **Porcelain Lined Cylinders:** This is no experiment on Bean Pumps copied to meet demands of competition. It is original with Bean Pumps, put on under spec al secret process, and sprayer buyers should beware of imitations of this Bean Feature that have not stood the test of time. Bean Porcelain Lined Cylinders are long lived. They do not corrode.

4. **Eccentric Instead of Cranks:** Eccentrics are much more durable than cranks, because the wear is distributed over so much larger area. When, after years of use, the eccentrics do show wear, the wear can be taken up in a few moments.

5. **One-piece Steel Bed Plate Frame:** The Bean was the first sprayer offered with an all-steel frame and is today the only sprayer in which the steel bed plate frame is made in a single piece. The pump and engine is bolted to this steel frame, which will not warp or spring, thus assuring sturdiness.

6. **Underneath Suction:** With the Bean Power Sprayer it is only necessary to loosen one set screw and the whole bottom of the well comes off, so that the tank can be entirely drained in a few seconds. Besides, the level of the liquid in the tank is always higher than valves in the pump and flows into them without assistance from the engine.

7. **Other Features:** The above as well as many other features are more fully described in the large Sprayer catalogue, which we will gladly mail on request.

Three IDEAL SPRAYS for the Citrus Grove

Ideal Bordeaux Oil Emulsion

Semi-liquid in consistency. A real Bordeaux product. Used 1½ gals. to 50 gals. water gives a 3-3-50 Bordeaux mixture with 1% oil. Best for Citrus Scab and Melanose control.

Ideal Oil Emulsion Paste

Liquid in consistency. Mixes with any hard water. Unequaled for killing White Flies and Scale Insects. Keeps indefinitely.

Ideal Lime Sulphur Solution

A pure, clear, filtered product, 32 to 33 degrees in density. The perfect spray for Red Spiders and Rust Mites. The best sulphur spray for Scab.

FLORIDA AGRICULTURAL SUPPLY COMPANY

JACKSONVILLE, FLA. LAKE WALES, FLA.

Floridian Develops Powerful Turbine

When one thinks of some wonderful new discovery or achievement, whether in scientific, mechanical or commercial lines, one naturally thinks of crowded cities and busy scenes of traffic and commerce—but one is not always right.

Down in the little village of Grant, over on the East Coast of Florida, has been developed a wonderful little hydro-electric turbine which promises to revolutionize motive power along many lines.

This is the Couch hydro-electric turbine, invented and developed by Roy Couch of Grant, Florida. Mr. Couch tells of the developmen of h invention as follows:

Couch Hydro-Electric Plant

The Couch centrifugal type turbine was finally brought to its present high efficiency in February, 1922, after a series of experiments and trying out different designs for a period of over five years; the idea in developing this turbine was to produce a turbine capable of sufficient speed on low pressures, to allow it to be directly connected to a generator of moderate speed, so as to make a direct connected, compact hydro electric plant that could be used in connection with artesian wells, or other small water powers.

The first turbine, constructed in 1918, showed sufficient speed but only developed 40% efficiency; this was very discouraging, so another turbine was designed more or less theoretically correct for the use intended. This turbine had the speed and actually gave 55% efficiency but it was not yet good enough to place on the market.

The next design was a horizontal turbine of the central intake type, discharging into a spiral case; all curves and angles of entrance and discharge were carefully calculated and checked over. A turbine was then built according to this design and upon testing same it operated at the proper speed and showed an efficiency of 65%; this was better but something must be wrong with the design, so all figures were carefully rechecked but no error in calculation could be found; so it looked as if 65% efficiency was the limit. Now to lose 35% of your power in the turbine, then lose 40% or more in your generator, would leave you only 26% of your water power as useful energy—this would not do, for, while the artesian water did not cost anything, the average sized well is only 4 inches, and 26% of the power of a 4-inch well would not do very much work. Therefore, some further improvement must be made in the turbine. The theoretical side being exhausted, it only remained to experiment with some special blade curves; and after building several more turbines a blade curvature was finally worked out which gave this turbine an efficiency of 87%.

No further gain in efficiency could be made even though several more turbines were built with different designs of blades. To assure an exact reproduction of the correct blade curvature dies were constructed to die cast the rotor and distributors of these turbines.

87% efficiency is considered very good in Francis Type turbines of 1000 to 10,000 H. P., but to bring these same turbines down to ½ to 2 H. P. would bring their efficiency down to 65 to 75%; so 87% for the Couch turbine is exceptionally high considering the small size of the turbine. The turbine now being perfected and patent application made, the next thing was to market them.

Mr. Couch received numerous proposals to dispose of the patent rights to this turbine on a stock promotion basis, but, as he saw a great future for these small Hydro-Electric plants as a means of utilizing small water powers for domestic uses as well as larger developments, he decided to manufacture this hydro-electric equipment at his own shops in Grant, Fla. With this end in view patterns were completed for the various sized units, a foundry was installed and the actual work of production started. Arrangements were made with the General Electric Co. to furnish generators built especially for these plants, and completed units were soon ready for delivery. Agencies were established, plants were installed in various sections of the state, and results have justified in every way the time and money expended to perfect this highly efficient Hydro-Electric Unit.

The floor space and equipment of the Couch Manufacturing Co. is now being practically doubled in order to provide ample room and facilities for the manufacture of these plants.

Many of these turbines have been placed in use all over Florida, and one has been installed as far away as Wisconsin. The original turbine has been in use constantly since February 1922, in the plant of the Couch Manufacturing Co. at Grant, Fla.

FRED THOMAS
National DETECTIVE Agency
Licensed and Bonded
Civil and Criminal Investigations
TAMPA, FLORIDA
P. O. Box 1582 Phones, 4140-2224
The Largest and Best in the South

Prepare Now for the Planting of Your Orange or Grapefruit Grove

While Rutherford B. Hayes was president of the United States, before Bloxham was governor of Florida, Buckeye Nurseries were leaders in the citrus industry of this state—just as they are today.

For forty-three years Gillett-grown trees have been producing the widely-heralded, big-money revenues in the profitable orange and grapefruit groves of Florida. Buckeye has a reputation to maintain. It will maintain it.

Buckeye's estimated production for the season of 1923-24 is nearly 800,000 trees. More than half of these have already been reserved by wise and experienced growers. It is now indicated that next year's demand for dependable citrus trees will again be in excess of the supply.

Consult Buckeye Nurseries now as to the varieties and stocks you will want to plant.

Buckeye Nurseries, Inc.

820 Citrus Exchange Bldg.,

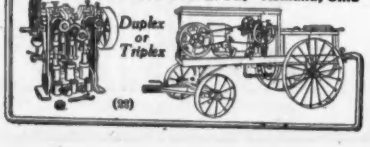
Tampa, Florida.

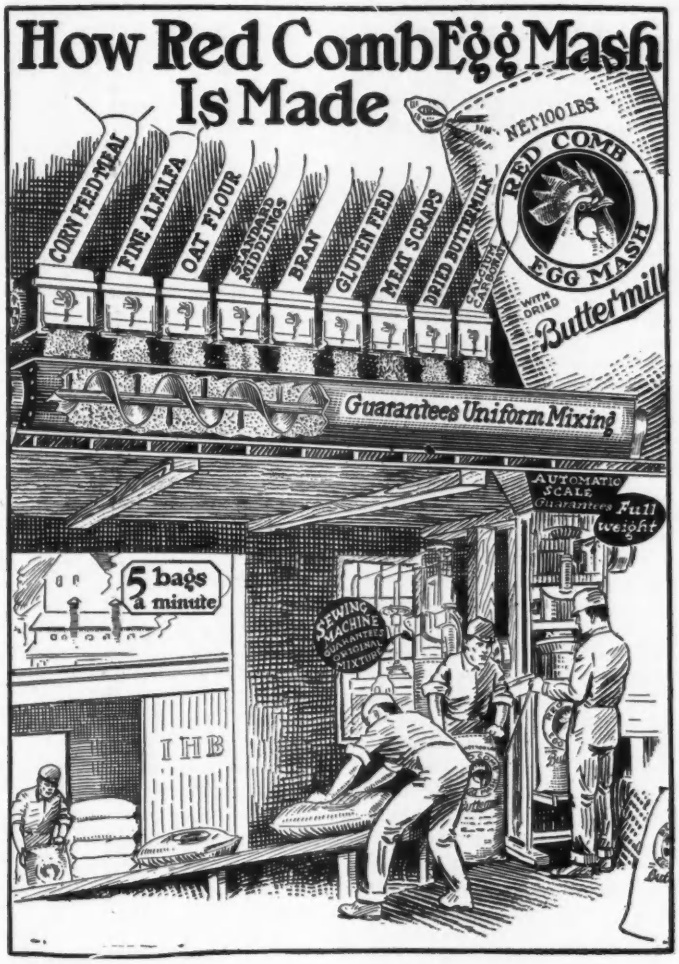
Largest Exclusively Citrus Nurseries in the World.

MYERS
HONOR-BILT
SPRAY PUMPS

AN absolute necessity for the successful citrus grove. Unequalled for easy, rapid, thorough spraying. Every desirable style and size. Hand Pumps with easy operating cog gear handle—Power Pumps with automatic pressure control—give powerful penetrating spray that reaches every leaf and blossom, every nook and corner. The Myers line includes Pumps for Every Purpose, Hay Tools and Door Hangers. Ask your dealer or write us.

THE F. E. MYERS & BRO. CO.
592 Church St., Ashland, Ohio





"POULTRY HEALTH IS ONE, IF NOT THE GREATEST, FACTOR INFLUENCING PROFITABLE AND ECONOMICAL POULTRY PRODUCTION." This is a very significant and true assertion made in a recent bulletin issued by the New Jersey Agricultural Experiment Station.

Stimulants, condiments, or mash feeds which force production, without keeping in mind the important factors of constitution and health, usually result in loss to poultrymen.

In the manufacture of RED COMB EGG MASH containing dried buttermilk, the balance between good egg production and at the same time good health, has been very carefully maintained. This is why RED COMB EGG MASH is more profitable from the poultryman's standpoint than any other mash he can purchase today.

If you have not already done so, give it a trial now.

FOR SALE BY FEED DEALERS EVERYWHERE

Jackson Grain Co.,

"Florida's Feed Specialists"

State Distributors

Tampa Florida Jacksonville

MANY EVILS OF PECAN INDUSTRY WIPED OUT BY BORDEAUX MIXTURE

A remedy for most of its evils lies in spraying the pecan tree with bordeaux mixture during summer, especially during the early months of the season. At least this is indicated by the results of years of investigational work and of practical experience.

While there are other contributing agencies for the control or prevention of diseases of the pecan, the most important thing to do to this end in summer is to give a few sprayings with 4-4-50 bordeaux mixture, covering the leaves, twigs and young fruit completely.

According to specialists of the Florida Experiment Station, this mixture is beneficial in curtailing--if not eliminating altogether—the losses from such diseases as scab, anthracnose, mildew, and brown leaf spot.

It is recommended that in fall and winter all leaves and nut shucks be picked up and burned or plowed deeply into the soil, in order that as many as possible of the spores of these diseases be destroyed. The pruning out of all dead wood from the trees in winter or spring is recommended, since the spores harbor in decaying matter.

However, even with the destruction of all leaves, nut shucks and dead wood, there may be some trouble from some of the diseases, and it is recommended that at least one spraying be made in May and June, and if diseases appear, more sprayings will have to be made.

Also if rains during the summer are frequent, it may be necessary to make several applications of the bordeaux mixture, since frequent rains will wash it off. One pound of resin fish-oil soap to each 50 gallons of the spray mixture adds to the spreading and sticking qualities of the spray.,

FEAR THAT GRAPEFRUIT PACKING WILL BE OVERDONE

Distributors express some concern over the numerous entries into the grapefruit canning industry, and there is a well-defined fear on the part of both the brokers and the distributors that the grapefruit canning business will suffer a severe setback as a result, according to "Canning Trade," a journal of the canning industry. This will not be the first item of canned foods which has suffered from "too many cooks." Some fear is also felt over a possible damaging effect upon the canned fruit salad market through overproduction, or packing of an inferior quality salad by some canners.

McDONALD & BURGMAN ADVERTISING FLORIDA

Through the efforts and influence of McDonald & Burgman, of Daytona, Florida distributors for Holt Caterpillar Tractors, Florida is getting many thousands of dollars of the most favorable advertising in a large list of leading magazines in the United States with a combined circulation of several millions, reaching from the Atlantic to the Pacific coast and throughout foreign countries.

The Saturday Evening Post, the Engineering News-Record and fifteen or twenty other leading publications are carrying illustrated page advertisements on the building of the Tamiami Trail through the Everglades, and as there seems to be a popular idea throughout the country that this portion of Florida is impenetrable and permanently useless, the fact that a fine paved highway is being built through this section of Florida will materially alter their opinion and establish Florida in their minds as the most progressive in highway construction, and should do much toward influencing motorists here for a trip through the Florida Everglades, as there are few places in the world where they will find the things of interest that can be seen on this trip.

McDonald & Burgman spared no trouble and expense in getting numerous photographs and data, and it was through their initiative and suggestion that the Holt Manufacturing Company is giving Florida this very desirable and effective advertising throughout the world.

Throughout Florida we have citizens who never miss an opportunity to contribute what they can toward the development of our state, and it is this universally prevailing spirit that is building the state and placing it in the very front ranks of the country's most progressive states.

CLASSIFIED ADVERTISEMENTS

The rate for advertisements of this nature is only three cents per word for each insertion. You may count the number of words you have, multiply it by three, and you will have the cost of the advertisement for one insertion. Multiply this by the total number of insertions desired and you will have the total cost. This rate is so low that we cannot charge classified accounts, and would, therefore, appreciate a remittance with order. No advertisement accepted for less than 50 cents.

REAL ESTATE

FOR SALE: Splendid solidly bearing orange grove in one of the best orange producing sections of the state. Soil of the best to be found anywhere. Quality citrus fruits produced up to the highest standard of excellence. Reason for selling, moving away. It is an opportunity worth while to some one. Address Box 114, Citra, Fla. 2t-pd

10 ACRE ORANGE, grapefruit grove, 6 years old, Lakeland Highlands, next to Haskell Townsite on Dixie Highway, near Haskell station and packing house Owner, H. J. Strimple, Penns Grove, N. J.

WILL EXCHANGE West Texas cattle ranch for unimproved or improved land in Florida. What have you? Give price and full particulars. T. E. Bartlett, 3410 McKinley Ave., ElPaso, Texas.

CALIFORNIA
$5,000 CASH—$5,000
Balance 1-2 NET profits from crops.
20 Acres full bearing Navels. $10,000 eight room house.
Chance to acquire beautiful home and profitable business with small outlay.
Buyer must know citrus culture and reside on property.
Other business interests cause this exceptional opportunity.
CLARENCE GELDERT, Owner.
1765-G North Bronson Avenue, Los Angeles, California.

EARLY BEARING Papershell Pecan trees, budded or grafted and guaranteed. Great shortage this year. Write for catalog today. Bass Pecan Company, Lumberton, Miss.

WANT to hear from owner having farm for sale; give particulars and lowest price. John J. Black, 180th Street, Chippewa Falls, Wisconsin. Dec. 3t

NURSERY STOCK

FRUIT TREES—Large stock of all kinds of fruit and ornamental trees, roses, shrubs, vines, etc. Order direct from growers. Most complete line offered in Southwest. Free catalogue. Express paid. Consolidated Nursery. Houston, Texas. tf

ADAPTED BUNCH GRAPES bring paying returns eighteen months after planting. Plant an acre and be independent; best commercial fruit investment in south, fruit brings highest prices. We introduced these grapes into Florida and they have been doing well ten seasons. Other adapted fruits also—tree blueberries, blackberries, figs, etc. Full information, free catalog. Adapted Nurseries, Tampa, Fla. 100-tf

PAPER SHELL PECAN GROVE. Most trees 12 and 13 years old, which is full bearing age. Good condition. Forty acres. Located near Monticello, Fla., Price $500.00 per acre. Simpson Orchard Co., Vincennes, Ind.

FOR SALE—700 Valencia, Pineapple, Marsh 4-year buds. Probably best in state. 1000 nursery stock. Sealed bids, Dec. 20. For information apply U. S. Dept. Agriculture, Box 1058, Orlando, Fla.

ADAPTED GRAPES are planted with excellent results all through March. Free catalog. Adapted Nurseries, Tampa, Florida. tf

FOR SALE—Peas and velvet beans of all kinds. New bags, even weights. All peas recleaned. H. M. Franklin, Tennille, Ga. Mar.-4t

MISCELLANEOUS

WHITE WYANDOTT Cockrels, regal strain—the best in the country, direct from Martin pens. Utility and show birds $5.00 each; also eggs for hatching $5.00 per 15. W. A. King, Gen. Del., St. Petersburg, Florida.

FOR SALE—Dairy and stable manure, car lots. Link & Bagley, Box 2461, Tampa, Florida.

SOUTHDOWN SHEEP, White Rocks, Toulouse Geese, Guineas, Angora and Milk Goats, Circular free. Woodburn, Clifton, Va.